MATTHEW MACLEAR (State Bar No. 209228)
Email: mcm@atalawgroup.com
JASON FLANDERS (State Bar No. 238007)
Email: jrf@atalawgroup.com
ERICA A. MAHARG (State Bar No. 279396)
Email: eam@atalawgroup.com
J. THOMAS BRETT (State Bar No. 315820)
Email: jtb@atalawgroup.com
AQUA TERRA AERIS LAW GROUP
4030 Martin Luther King Jr. Way
Oakland, CA 94609
Tel: (415) 568-5200

[Additional counsel on p. 2]

Attorneys for Plaintiff
CALIFORNIA SPORTFISHING
PROTECTION ALLIANCE

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF CALIFORNIA

CALIFORNIA SPORTFISHING PROTECTION ALLIANCE,

Plaintiff,

v.

PACIFIC BELL TELEPHONE COMPANY

Defendant.

Case No: 2:21-cv-00073-JDP

SECOND SUPPLEMENTAL DECLARATION OF MATTHEW C. MACLEAR IN SUPPORT OF PLAINTIFF'S MOTION TO AMEND SCHEDULING ORDER

Hearing Date: January 25, 2024
Time: 10:00 a.m.
Courtroom: 9, 13th Floor
Magistrate Judge: Hon. Jeremy D. Peterson

ANDREW L. PACKARD (State Bar No. 168690)
Email: andrew@packardlawoffices.com
WILLIAM N. CARLON (State Bar No. 305739)
Email: wncarlon@packardlawoffices.com
Law Offices of Andrew L. Packard
245 Kentucky Street, Suite B3
Petaluma, CA 94952
Tel: (707) 782-4060
Fax: (707) 782-4062

WILLIAM VERICK (State Bar No. 140972)
Email: wverick@igc.org
KLAMATH ENVIRONMENTAL LAW CENTER
1125 16th Street, Suite 204
Arcata, CA 95521
Tel: (707) 630-5061; Fax: (707) 630-5064

J. KIRK BOYD (State Bar No. 122759)
Email: jkb@drjkb.com
LAW OFFICE OF JOHN KIRK BOYD
548 Market St., Suite 1300
San Francisco, CA 94104-5401
Tel: (415) 440-2500

BRIAN ACREE (State Bar No. 202505)
Email: brian@brianacree.com
LAW OFFICES OF BRIAN ACREE
331 J Street, Suite 200
Sacramento, CA 95814
Tel: (916) 505-6861

DECLARATION

I, Matthew C. Maclear, declare as follows:

1. I am an attorney, licensed to practice law in all courts of the State of California. My firm, Aqua Terra Aeris Law Group ("ATA") and I serve as counsel for Plaintiff California Sportfishing Protection Alliance ("CSPA"). I have personal knowledge of the facts in this Declaration and, if asked, could and would testify to the accuracy of these facts in a court of law.

2. I offer this Supplemental Declaration to provide additional details in support of CSPA's Motion to Amend the Scheduling Order (ECF No. 85) and pursuant to the Court's guidance at the hearing on the Motion on January 25, 2024 ("Hearing").

I. PERMITTING REQUIREMENTS

3. The majority of the Cables are located within the boundaries of two State parks: Emerald Bay State Park and D.L. Bliss State Park. Based on GPS information provided through surveys conducted by CSPA's consultants, as well as other information in the record, the following are best estimates of length of the cables in Lake Tahoe. The longest cable, often referred to as Cable B, is approximately 6 miles in length along the western shore of Lake Tahoe and runs north and south outside of Emerald Bay to the east of the mouth. There are approximately 0.87 miles of Cable B outside the Emerald Bay State Park southern boundary and approximately 0.88 miles of Cable B outside of D.L. Bliss State Park's northern boundary. Cable A is the shorter cable inside Emerald Bay and the State Park and is approximately 0.37 miles long. Cable C is also inside Emerald Bay entirely within Emerald Bay State Park and is approximately 0.45 miles long. Thus, only about twenty-five percent of the cables are not within the jurisdiction of a State Park.

4. California Department of Parks & Recreation ("CDPR") requires a permit for sediment and biological sampling within a State park. Thus, CSPA must acquire a permit from CDPR to remove any sediment or biological samples to test for scientific study purposes.

5. As stated in my previous declaration, ECF No. 94-2, ¶ 8, a representative of CDPR told an associate at ATA that this permit was required and that it would take up to 90 days to process a permit, on November 3, 2023.

6. In addition to verbal direction, the CDPR website states the following:

> All requests for scientific research permits that involve biological, geological, or soil investigations/collections must be submitted on a DPR 65 (Rev. 09/2018) - APPLICATION AND PERMIT TO CONDUCT SCIENTIFIC RESEARCH AND COLLECTIONS form. [DPR 65 Application in pdf format] A study proposal and supporting documents are also required.

CDPR, Scientific Research and Collection Permit, *available at:* https://www.parks.ca.gov/?page_id=31354.

7. Because Plaintiff intends to take samples in the state parks, the permit application required CSPA to prepare a scientific study. The study must identify a principal investigator; provide an abstract or summary of the study; summarize relevant literature; identify the specific hypotheses an/or establish study objectives; identify with GPS location data the study area and each study/sample location; describe the sampling design, field and laboratory methods, statistical analysis, and/or models to justify the proposed sample size; detail the type, size, quantity and explain why collection is necessary; provide details on the type, location, area, depth, number and distribution of sediment sampling locations; describe anticipated products and deliverables resulting from the study, e.g. reports, publications, GIS layers, web tools, videos and how the study will be disseminated; and identify anticipated benefits to the California State Park System that may result from your proposed research.

8. CSPA has had multiple experts working together to create an interdisciplinary approach for the scientific study, the Quality Assurance Program Plan (QAPP), and Sampling and Analysis Plan (SAP). CSPA's consultants worked with its Principal Investigator on the sampling plan from November 20, 2023 to January 31, 2024, excluding multiple federal holidays, family holidays, travel and work on other matters.

9. The scientific study permit application was supported by the QAPP and SAP, a detailed 20+ page document, with multiple appendices. The QAPP and SAP were designed to guide the process of collecting and analyzing water, algal and bacteria (also referred to as biofilm), biota

and sediment samples, each with separate collection techniques. The scientific study, QAPP, and SAP are aimed at determining whether there are elevated lead concentrations in water and sediment near the submerged cables and whether the biota and biology of the lake are affected by the accumulation of lead or other metals from the cables. The preparation of the study, QAPP, and SAP were the result of research and consultation with an interdisciplinary group of consultants and university professors.

10. CSPA submitted the permit application, Scientific Study Summary, QAPP & SAP, CV for the Principal Investigator, and a cover letter to CDPR on February 1, 2024. True and correct copies of this application and related submittals are attached hereto as **Exhibit A**.

11. CSPA does not anticipate receiving the permit until possibly April 2023, but in cover correspondence to the California Dept. of State Parks we explained how similar studies had been pursued by Marine Taxonomic Services/Below the Blue and Defendant. Plaintiff has requested that this permit be expedited and has agreed to respond quickly to any inquiries or requests for additional information to help the accelerated processing of this permit application if possible.

12. As indicated in previous declarations, CSPA became aware of the permit requirement in early November 2023. However, because of the information required for the permit application as described above and detailed in Exhibit A, it took some time for CSPA to retain consultants, compile the necessary information, contact multiple competent testing laboratories, and finalize the application and necessary related attachments, despite the consultants working diligently.

13. CSPA could bifurcate the sampling events, sampling first for water quality and then coming back to the same locations at a different date to sample for sediment, so that sampling could begin sooner. However, doing so would double the days in which divers and consultants would need to sample, which would also double the cost of sampling. CSPA is required to pay per boat day and for data reconciliation for the boat crew but would also be required to pay the Principal Investigator twice for such efforts.

14. CSPA could also perform some sampling outside the State Park boundaries, but only four (4) of the approximately thirty (30) identified sample locations are outside the State Parks' boundaries. The daily boat and crew expense does not merit the significant expenditure for so few

combined (sediment and water) samples.

15. We currently anticipate that sampling, without expediting laboratory turnaround times, will cost CSPA over $35,000 for the boat, diver(s), ROV and boat pilots, and the Principal Investigator to be present and to transport to the labs and for the labs to run the requested analyses, and doubling this expense would render water quality and sediment testing an infeasible hardship. CSPA is a non-profit organization and all funding for this project must be obtained through donations and/or grants. Doubling the cost of sampling would, in turn, require CSPA to double its fundraising efforts, which is a significant burden on the organization and are not guaranteed to succeed.

II. SCHEDULING OF SAMPLING

16. In an effort to prepare a detailed schedule for the Court, I discussed the schedule for sampling with the consultants that have developed the sampling plan, laboratories (and/or consultants who have contacted the labs) who will be performing the analysis, as well as the divers who are conducting the sampling and understand the conditions needed to do so. CSPA's consultants include a hydrologist, a geohydrologist, a limnologist, an eco-toxicologist, divers, and a materials scientist.

17. To develop the sampling plan and the CDPR permit application, divers needed to survey the cables to select sampling locations. The completed surveys of Cables A, B, and C took seven days on the water with at least one more to go. These cable surveys have been occurring on good weather days in December 2023 and January 2024.

18. These consultants have advised me they will need four to eight days of sampling to complete sampling in accordance with the QAPP and SAP.

19. However, sampling days may not be able to occur on consecutive days depending on depths of samples and distances between and because of necessary time between high-altitude dives. Also, the high-altitude nature of the dive efforts require sufficient decompression time for the diver(s) and for the boat crew and Principal Investigator to debrief, ensure sample collection integrity and chain of custody procedures on days between dives. Moreover, sampling days are limited by other factors including, but not limited to: (1) weather conditions, such as snow, ice, and temperature; (2) water conditions, such as choppiness and wind; and (3) availability of divers and Principal

Investigator to be present for sampling, including travel time to/from Lake Tahoe. Severe weather conditions (such as wind, rain, and snow) can pose a risk to the safety of the sampling team, and some days may need to be cut short for safety concerns. Weather can also hinder the collection of representative samples because of increased turbidity caused by wind and current. If those conditions are present, sampling will need to be rescheduled.

20. Considering the factors limiting when sampling can occur, CSPA estimates that sampling will need to occur over the course of two to four weeks.

21. Because sampling cannot commence until CDPR issues the permit, CSPA anticipates that sampling will occur in April 2024 and finish mid-May 2024.

III. TIMING AND COST OF LABORATORY ANALYSIS

22. Since the January 25, 2024 hearing, my staff, myself and our consultants have contacted multiple laboratories in search of information regarding test methods they are certified to use, method detection limits, turnaround times (standard and expedited) and associated pricing.

23. On January 29, 2024, the lab we had intended to use, and with whom our consultant had initial conservations and obtained quotes, informed me they would not be able to perform any tests for plaintiff-side matters. This has necessitated further outreach and communication with multiple other laboratories to determine if they had the willingness, bandwidth, and capability to perform the types of tests identified in the sampling plan, in accordance with approved test methods, and on an expedited basis. Furthermore, we have inquired about test methods used, detection levels for the respective labs' equipment, provision of sample equipment (e.g. jars, bottles, etc.), turnaround times (from standard to expedited) and associated costs.

24. The labs have stated for water and sediment testing the typical turnaround times take anywhere from 15-20 business days from the receipt of the samples to production of the test results. For biofilm and biota sampling, which will be done in part at university laboratories and/or at private labs, there is additional preparation of the samples (including but not limited to acquisition of required labware, dissection, preservation and homogenization) that usually takes one to two weeks from receipt of the samples and two to four weeks do the microwave digestion and analytical testing

analysis for biological samples from the date of receipt of the prepared samples. There is not a formal expediting process at the university laboratories, whereas the private labs can expedite these samples.

25. CSPA intends to collect water and sediment samples at thirty separate locations. For each location, water samples will be analyzed for dissolved metals, total metals, and hardness, and sediment samples will be analyzed for lead. For quality control purposes, CSPA intends to take reference samples at ten locations, and blank samples will be run for each sample day.

26. For total and dissolved metals, it costs approximately $33 per sample per analyte (e.g. lead (Pb), zinc (Zn)). Water hardness will also be analyzed at a cost of about $35 per sample for the total metals water samples. Thus, each water sampling location will cost $101 for total and dissolved metals and hardness.

27. Sediment samples will be approximately $60 per sample.

28. Plaintiff's best estimate based on communications with multiple labs, expediting the test results and returned within five business days would double the cost per sample per analyte.

29. Thus, CSPA estimates that analyzing approximately 30 water quality sample locations for total metals, dissolved metals, and water hardness will cost about $3,030.

30. CSPA will also be analyzing one blank sample per day, and there are estimated to be a maximum of eight days of sampling. Each blank sample will cost $33/sample for an approximate cost of $270.00.

31. CSPA will also be taking one reference sample 50 feet to 100 feet away from the sample locations for every three sample locations, or approximately 10 reference samples for 30 sample locations. At $33/sample, the reference sampling will cost about $330.00.

32. CSPA estimates that 30 sediment samples at $60/each will cost approximately $1,800.00.

33. Thus, a regular turnaround time of 15-20 business days for water and sediment samples would cost approximately $5,430.00.

34. Expediting water quality and sediment samples would cost almost $11,000.00 for testing just for lead (Pb) and would save, at most, fifteen days.

35. For biological samples, the cost for sample preservation, preparation, homogenization/digestion, and analytical testing including percent moisture would costs approximately $180 per sample per analyte. Plaintiff anticipates possibly analyzing the biological samples for up to three to four analytes (Pb, Cd, Hg, and Zn), which could raise the costs to $375 per sample.

36. Again, there is no formal process to expedite biological sampling at the university labs, but at a private lab it is possible to do so. The routine analysis time is fifteen to twenty business days, and expediting the biological samples would take five business days.

37. Analyzing twenty biological samples would cost approximately $3,600.00 for just lead (Pb) with homogenization/digestion and percent moisture, and expediting would cost $7,200.00. If additional analytes were included it could cost up to $7,500.00 for standard turnaround times and up to $15,000.00 on an expedited basis. Again, this additional cost would save only fifteen days at most.

38. CSPA's consultant intends to summarize the data from the labs. Considering the extensive data that CSPA intends to collect and other priorities, this consultant anticipates this summarization will take two to three weeks.

39. Thus, CSPA anticipates that laboratory analysis (without expediting sample analysis) will take until mid-May 2024, and CSPA's consultant will have summarized the laboratory results for the experts to use in their analyses by the end of May or early June. By expediting at least some of the samples, CSPA expects that it could have the summarized laboratory results to experts for use in their analysis by mid-to-late-May, 2024.

IV. EXPERT ANALYSIS AND PREPARATION OF REPORTS

40. At this point, CSPA anticipates disclosing three to five experts to opine on the relevant evidence, discharges, and threats of harm to Lake Tahoe.

41. I have personally discussed the time and information each expert needs to finalize their expert reports for this case. All of them will be reviewing the sampling that CSPA anticipates collecting, as described above.

42. Expert disclosures are currently due on April 12, 2024, and while current expert plans

may change, CSPA discloses the names of the experts that are a part of the CDPR permit application. However, CSPA chooses not to disclose the names and specific nature of experts that were not part of the CDPR application and will do so on the expert disclosure date.

43. Ian Wren indicates he will need between two to three weeks to prepare his report, after all test results are summarized and verified.

44. Sudeep Chandra indicates he will need three to four weeks to prepare their report, after all test results are summarized. Mr. Chandra also extensively travels for work and identified the following travel dates: February 19 - March 6, 2024; March 11-15, 2024; April 15-20, 2024; May 1-10, 2024; June 18-22, 2024; and June 28 - July 20, 2024.

45. Expert 3 indicates they will need approximately two to three weeks to prepare their report, after all test results are summarized. Expert 3 is unavailable March 2024, because he will be attending a conference, testifying at trial, and has booked international travel plans.

46. Expert 4 indicates they will need approximately two to three weeks to prepare their report, after all test results are summarized.

47. Expert 5 indicates they will need three to five weeks to complete the report.

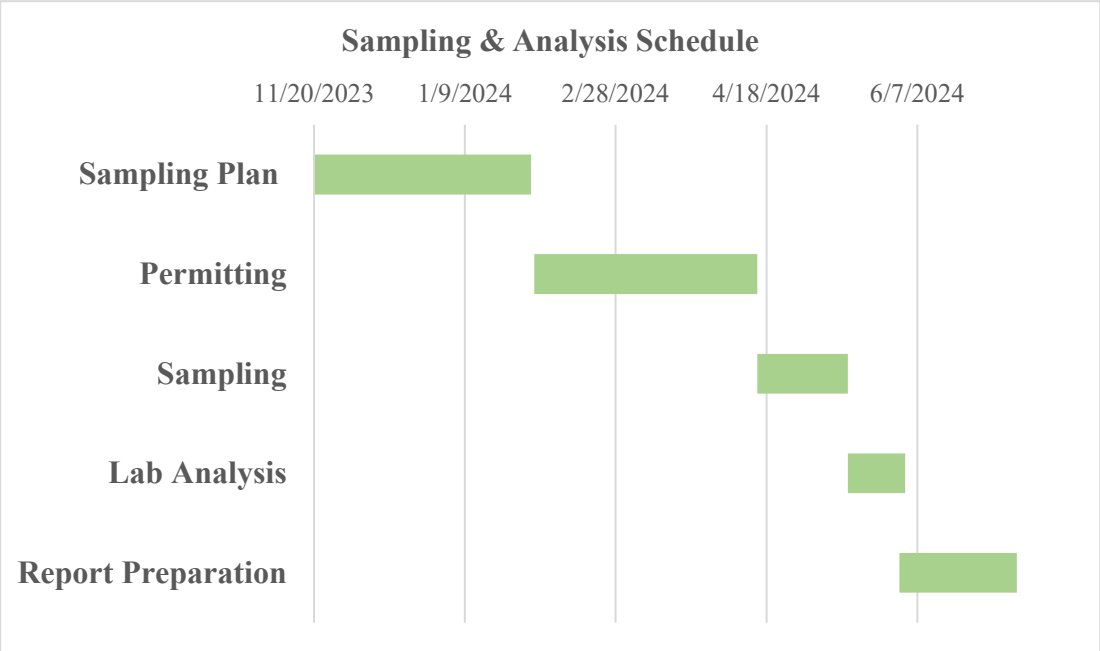
48. CSPA anticipates needing an additional week to finalize reports and compile all necessary supporting documentation for disclosures.

49. Accordingly, an additional five weeks will be necessary to prepare expert reports after test results are summarized. Thus, CSPA anticipates that expert reports can reasonably be finalized the first week of July 2024.

V. REVISED SHORTENED SCHEDULE

50. The following table and graph are a summary of the sampling and analysis timelines, based on the above information:

Task	Estimated Start Date	Estimated End Date	Duration (Days)
Develop Sampling Plan	11/20/2023	1/31/2024	72
Permitting	2/1/2024	4/15/2024	74
Sampling	4/15/2024	5/15/2024	30
Lab Analysis	5/15/2024	6/3/2024	19
Report Preparation	6/1/2024	7/10/2024	39



51. Based on the Court's direction at the January 25, 2024 hearing and discussions with experts, consultants, and laboratories, CSPA proposes the following revised shortened schedule:

Deadline	Scheduling Order Dkt. No. 70	CSPA Proposed Extension (ECF No. 85)	Revised Proposed Schedule	Shortened (Days)
Notice of subject matter for each expert report	3/22/2024	7/24/2024	6/26/2024	26
Expert disclosures	4/12/2024	8/10/2024	7/10/2024	31
Rebuttal disclosures	5/10/2024	9/20/2024	8/16/2024	35
Last day to hear motions to compel	6/20/2024	11/8/2024	9/25/2024	44
Discovery closes	7/12/2024	12/31/2024	10/18/2024	74
Last day to hear dispositive motions	9/12/2024	2/28/2025	12/17/2024	73

I swear under penalty of perjury under the laws of the State of California and the United States that the foregoing is true and correct. This declaration was executed on February 1, 2024 in Oakland, California.

s/ Matthew C. Maclear
Matthew C. Maclear

EXHIBIT A

ATA
AQUA TERRA AERIS LAW GROUP

4030 MARTIN LUTHER KING JR. WAY
OAKLAND, CA 94609

MATTHEW C. MACLEAR
PARTNER

T: 415-568-5200
mcm@atalawgroup.com

February 1, 2024

Via Priority Mail Express

California Department of Parks and Recreation
Sierra District
P.O. Box 266
Tahoma, CA 96142-0266

RE: Application and Permit to Conduct Scientific Research and Collections

Dear Sierra District Director:

Please find enclosed a copy of Plaintiff California Sportfishing Protection Alliance's ("CSPA") *Application and Permit to Conduct Scientific Research and Collections* related to water, sediment, biofilm and biota sampling in Lake Tahoe, CA.

CSPA requests, to the extent possible, the processing of this permit be expedited. CSPA is aware of other sampling occurring in and around abandoned telecommunications cables in Emerald Bay and along the western shore of Lake Tahoe by Marine Taxonomic Services/Below the Blue and Pacific Bell Telephone Company/AT&T. Hopefully, this proposed study does not present any novel issues which could slow the permit issuance. Please let me know if there are any impediments to expediting this permit application.

CSPA is committed to promptly providing the Department of Parks and Recreation (CDPR) with any additional or clarifying information CDPR needs. To expedite transmission of any such requests, please contact the undersigned directly at (415) 568-2000 or at mcm@atalawgroup.com.

Thank you for your time and attention to this request for a scientific study and collection permit.

Respectfully,

Matthew C. Maclear
Attorney for Plaintiff
California Sportfishing Protection Alliance

State of California - Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

APPLICATION AND PERMIT TO CONDUCT SCIENTIFIC RESEARCH AND COLLECTIONS

☒ BIOLOGICAL ☐ GEOLOGICAL ☐ PALEONTOLOGICAL
☒ NEW ☐ RENEWAL

FOR DEPARTMENT USE ONLY	
APPLICATION NO.	DATE RECEIVED
DISTRICT NAME	CEQA
PERMIT TYPE: ☐ Biological ☐ Geological / Soils ☐ Paleontological ☐ Other:	
☐ Summary Report Received	
☐ Insurance Required ☐ Liability Waiver Required	

The Principal Investigator hereby applies to the Department of Parks and Recreation for a Permit under Title XIV, California Code of Regulations, Section 4309, and Public Resources Code Section 5097.5/5001.65, to conduct investigations on lands of the State of California.

Instructions: Applications must be TYPED and signed upon submission. If more space is needed, continue on separate sheet(s). Attach to your application: (1) a Curriculum Vitae (CV) or résumé for the Principal Investigator (and for the person(s) overseeing field work, if different from PI); (2) maps, coordinates, and/or GIS files indicating precise locations of proposed work; (3) a full study proposal; **and** (4) copies of any additional permits required for your research. Complete application packages should be sent to the district office that administers the park unit(s) where the research will take place, or to the Natural Resources Division, Sacramento, for multi-district requests. *At the request of the Department, you may be required to submit proof of insurance and/or obtain participant liability waivers.*

APPLICANT ORGANIZATION	PHONE NO. (Incl. Area Code)
California Sportfishing Protection Alliance ("CSPA")	(510) 421-2405
ORGANIZATION MAILING ADDRESS / CITY / STATE / ZIP CODE	E-MAIL ADDRESS
P.O Box 1061, Groveland, CA 95321	cshutes@calsport.org

PRINCIPAL INVESTIGATOR (PI) - ATTACH RÉSUMÉ OR CV
(NOTE: Faculty advisor/sponsor must sign as PI for student applicants)

NAME	TITLE	CELL PHONE NO. (Incl. Area Code)
Ian Wren	P.I., Project Manager & QA/QC Officer	(415) 810-6956
MAILING ADDRESS / CITY / STATE / ZIP CODE		E-MAIL ADDRESS
PO Box 31896, San Francisco, CA 94131		ian@wrenws.com

PERSON IN DIRECT CHARGE OF FIELD WORK - ATTACH RÉSUMÉ OR CV IF DIFFERENT FROM PI

NAME	TITLE	CELL PHONE NO. (Incl. Area Code)
Ian Wren	P.I. Project Manager & QA/QC Officer	(415) 810-6956
MAILING ADDRESS / CITY / STATE / ZIP CODE		E-MAIL ADDRESS
PO Box 31896, San Francisco, CA 94131		ian@wrenws.com

ADDITIONAL PARTICIPANTS - ATTACH CONTINUATION SHEETS, IF NECESSARY

	NAME	TITLE	CELL PHONE NO. (Incl. Area Code)
1	Kris Kierce	Dive Master, sampler	(775) 844-3483
	MAILING ADDRESS / CITY / STATE / ZIP CODE		E-MAIL ADDRESS
	100 McFaul Way, Suite F, Zephyr Cove, NV 89448		info@tahoedivecenter.com
2	Scott Fontechio	Diver / ROV pilot / boat pilot	(530)318-0082
	100 McFaul Way, Suite F, Zephyr Cove, NV 89448		deepwaterrovman@gmail.com
3	Nic Kierce	boat pilot	(530) 307-8248
	100 McFaul Way, Suite F, Zephyr Cove, NV 89448		info@tahoedivecenter.com
4	Sudeep Chandra	Prof. of Limnology	(775) 354 -4849
	University of Nevada, Reno, 1664 N. Virginia St., Reno, NV 89512		sudeep@unr.edu
5	Frank von Hippel	Prof. of Env. Health Sciences	(907) 250-8441
	1295 N. Martin Ave, Drachman Hall, Bldg. A A229, PO Box 345210, Tuscon, AZ		frankvonhippel@arizona.edu
6			
7			

STATE PARK UNIT(S) TO BE INCLUDED ON PERMIT	COUNTY(IES)
California Department of Parks and Recreation, Sierra District Office: Emerald Bay State Park D.L. Bliss State Park	El Dorado County (Emerald Bay, Lake Tahoe, CA)

1. PROJECT TITLE

Water, Sediment, Biofilm, and Biota Sampling in and around Emerald Bay, Lake Tahoe, California

2. PROJECT PURPOSE

Water, biofilm, species and sediment sampling and water quality monitoring for lead (Pb), hardness, and field measurements is intended to answer general questions regarding whether constituents of submerged cables found in Lake Tahoe, in and around Emerald Bay, are discharging lead into sediment, biofilms, biota and/or water, or accumulating in species inhabiting waters, sediment and biofilms around the submerged telecommunications cables.

3. DESCRIPTION OF PROJECT LOCATION(S) *(Also attach maps, coordinates [projection required for the GPS coordinates], and/or GIS files for each distinct location.)* **For Paleontological permits:** Provide Geological Formation

This Sampling Program will include the collection of individual water, biofilm, biota and/or sediment samples for analysis of Pb and hardness. Field measurements shall be collected in water to document nearby and ambient conditions around the submerged telecommunications cables. Samples will be collected in close proximity (one inch or closer for water samples and less than 4 inches for sediment samples) to submerged telecom cables as well as from reference sites located approximately fifty (50) feet away from the submerged cables. One (1) water quality and one (1) sediment sample shall be collected at each location, coinciding with the location of frayed, worn, defective or damaged cables. One (1) biofilm sample will be taken if present on the cable or within 6 inches of the location of the frayed, worn, defective, broken or damaged portion of the telecom cables. Biota, including bivalves, freshwater crustaceans, and/or fish, shall be collected on an opportunistic basis. One (1) water and one (1) sediment sample shall be collected at a reference site for every few sampling locations. For a further explanation please refer to the Scientific Study Summary and for greater details please see Quality Assurance Program Plan & Sampling and Analysis Plan for Water, Sediment, Biofilm, and Biota Sampling in and around Emerald Bay, Lake Tahoe, California, both submitted contemporaneously herewith.

4. METHOD OF ACCESS *(Describe methods [including type of vehicle] to be used for accessing study sites after arrival at the park unit(s).)*

Access to the submerged cable locations will by boat and by divers.

5. SUMMARY OF FIELD METHODS AND ACTIVITIES

A YSI Pro1030 multi-parameter probe and meter shall be used to measure field parameters, including temperature, pH, conductivity, and salinity. Prior to each day of sampling, the probe shall be calibrated according to manufacturer's specifications. Calibrations for pH shall rely on at least three standards (4, 7, and 10) and calibrations for specific conductivity shall use at least two calibration standards. Measurements shall be recorded from the surface at each sampling location, using a multi-parameter probe with a cable of sufficient length to measure ambient conditions close to the sampling locations. Location, time, and depth of measurement shall be recorded at each sampling location. Instruments shall be handled with care and transported in a hard-shell case.

During specific sampling events, the assigned field team will gather water and sediment samples to test for lead (Pb) and other specified substancesfrom approximately 30 locations over 6.5 miles of cables. Divers will carry out this sampling with support from a team on a nearby boat. The method involves carrying capped or plugged syringes or needles to a sample location, carefully approaching cable to avoid and/or minimize disturbing sediment, uncapping or unplugging the syringe or needle within six (6) inches of the cable, and directly fillings syringes or needles with water samples at one (1) inch or closer to the cable. Biofilm shall be collected from the cable surface. Surface sediment shall be collected as close to the underwater cables as possible (at a distance of no more than 4 inches in lateral distance from the cable and at a depth of less than one inch). Biota shall be collected on an opportunistic basis and the location, distance from a cable, and any other relevant information shall be recorded. Water samples shall be divided to test for total and dissolved metals. The portion for dissolved metals analysis will be field-filtered within 15 minutes of sample collection directly into containers that already contain preservatives. These samples will be stored in a cooler and transported to the multiple labs, adhering to the required hold time limits.

For a further explanation please refer to the Scientific Study Summary and for greater details please see Quality Assurance Program Plan & Sampling and Analysis Plan for Water, Sediment, Biofilm, and Biota Sampling in and around Emerald Bay, Lake Tahoe, California, both submitted contemporaneously herewith.

6. TYPES OF SPECIMENS TO BE COLLECTED *(List species, quantity, size, and condition.)*

See above and for a further explanation please refer to the Scientific Study Summary and for greater details please see Quality Assurance Program Plan & Sampling and Analysis Plan for Water, Sediment, Biofilm, and Biota Sampling in and around Emerald Bay, Lake Tahoe, California, both submitted contemporaneously herewith.

7. EXPECTED DURATION OF THE PROJECT *(Specify overall project start and end dates and start and end dates of field investigations.)*

Sampling in D.L. Bliss and Emerald Bay State Parks will occur once a permit from the California Dept of Parks and Recreation is obtained. Sampling outside the referenced State Parks may occur from February to April 2024, depending on safe weather and lake conditions. Each sampling event is anticipated to require two (2) days of field effort, depending on the number of samples to be collected.

8. PLACE AT WHICH LABORATORY WORK WILL BE PERFORMED *(Institution, address, and responsible official name, phone number, and e-mail address)*

Caltest Analytical Laboratory, 1885 North Kelly Rd. Napa, CA 94558, (707) 258-4000
Eurofins-Tustin, 2841 Dow Ave, Suite 300, Tustin, CA 92780 623-298-1040
Univ. of Nevada, Reno, Global Water Center, 1072 Evans Street, Reno, NV 89512, (775) 682-6066
Univ. of Arizona, Arizona Laboratory for Emerging Contaminants, Gould-Simpson Building, Room 611, P.O. Box 210077, Tucson, AZ 85721

9. FACILITY THAT HAS AGREED TO CURATE SPECIMENS COLLECTED UNDER THIS PERMIT *(Institution, address, and responsible official name, phone number, and email address)*

N/A - No collected specimens are expected to be curated after analytical testing.

10. LOCATION OF DATA AND DATA PRODUCTS COLLECTED UNDER THIS PERMIT *(Specify institution name and/or website where data, maps, reports, GIS files, photos, and other data products (not specimens) will be archived after the project is completed.)*

California Sportfishing Protection Alliance shall maintain the data, maps, reports, GIS files and other data in its archives, but will make all data available to agencies and the public upon request, and may dedicate a website/webpage to access the data.

NOTE: APPLICATION IS INCOMPLETE UNTIL SIGNED.

California Sportfishing Protection Alliance ("CSPA")

Ian Wren

PERMIT TO CONDUCT SCIENTIFIC RESEARCH AND COLLECTIONS

ALL PARTICIPANTS MUST CARRY THIS PERMIT AT ALL TIMES WHILE CONDUCTING FIELD RESEARCH/COLLECTIONS.

The Department of Parks and Recreation desires to further scientific research within its jurisdiction through cooperation with researchers within the Department's mission to provide long-term protection and management of ecological processes and natural resource elements.

STANDARD CONDITIONS AND RESTRICTIONS

1. General classroom collection is not allowed under this permit.
2. This permit applies only to non-cultural materials, and is limited to the kind, number, and sizes of collections described on this form. Archeological material may NOT be collected under this permit.
3. "Collections" are defined as any material gathered during permitted activity. The collections shall be used for scientific or interpretive purposes only, and shall not be used for commercial purposes. Collections shall remain property of the Department. Curated collections shall be maintained by the Institution listed on page 3, item number 9. Collections should be accomplished by methods that conserve resources. Collections may be transferred to another location with prior written approval from the Department.
4. The collecting must be done away from roads, trails, and developed areas, unless such localities are specified in the permit. Collection shall be done in an inconspicuous manner, and shall not cause damage to the environment. The Department may impose permit-specific conditions (See page 6). Permit-specific conditions shall supersede any conflicting standard conditions and restrictions.
5. Activities conducted in areas designated as sensitive require prior surveys conducted by a State Park resource specialist, and/or a State Park resource specialist may be assigned to the project as a monitor. At the sole discretion of the Department, the Permittee may be required to schedule surveys and/or reserve a project monitor and reimburse the Department for the State Park resource specialist's time and expenses.
6. The Permittee shall submit a summary of information gathered to the applicable District where the investigation(s) took place, and to the Chief of the Natural Resources Division in Sacramento. The Permittee must also make available to the Department any material published as a result of this permit. Upon completion, a copy of such published material shall be submitted to: Natural Resources Division, Department of Parks and Recreation, PO Box 942896, Sacramento, CA 94296-0001.
7. The Permitee shall contact the appropriate District Superintendent (or designee) to receive district approval prior to proceeding with any field activities, and to present a copy of this permit, together with evidence of additional licenses and permits, if required.
8. All participants conducting activities approved by this permit shall inspect their shoes, clothing, vehicles, tools, and equipment for the presence of organic matter and soil, and if present, shall clean these items prior to entering and upon leaving the park to minimize potential spread of invasive species.
9. If permit activities are not carried out to the satisfaction of the Department, this permit may be immediately cancelled.
10. All applicable laws and regulations must be observed by participants in exercising the privileges granted in this permit. It is the responsibility of the Permittee to obtain any additional permits or approvals required for research/collection activities, and to know the boundaries and managing authority of specially designated protected areas or sanctuaries.
11. The Permittee, and all participants, are responsible for knowing and complying with all general rules and regulations for use of Department lands as well as any specific conditions or regulations for this permit and subject property.
12. Applicant Organization agrees to comply with the waiver and indemnity requirements found on page 5, incorporated by reference.
13. For activities presenting greater risk or liability, and at the sole discretion of the Department, Applicant Organization may be required to obtain and present sufficient proof of insurance and/or obtain signed liability waivers from all participants.
14. Questions regarding this permit should be directed to the District Superintendent or the Natural Resources Division's Research Permit Coordinator (multi-district).

I have read the Standard Conditions and Restrictions above and agree to comply with any additional special conditions. I certify under penalty of perjury that all information on this application (including attachments) is true, complete, and correct.

PRINCIPAL INVESTIGATOR'S SIGNATURE *(Faculty sponsor must sign for student applicants)*	PRINTED NAME	DATE
► Ian Wren	Ian Wren	Feb 1, 2024
STUDENT APPLICANT'S SIGNATURE (IF APPLICABLE)	PRINTED NAME	DATE
►		

It is the responsibility of the Principal Investigator to ensure that all participants comply with all standard and special conditions. It is the responsibility of the Applicant Organization to meet indemnification and insurance requirements.

California Sportfishing Protection Alliance ("CSPA")
Ian Wren

PERMIT TO CONDUCT SCIENTIFIC RESEARCH AND COLLECTIONS
WAIVER and INDEMNITY AGREEMENT

Waiver Agreement

Applicant Organization waives all claims and demands against the California Department of Parks and Recreation, its officers, agents, and/or employees for any and all loss, injury, death or damage caused by, arising out of, or in any way connected with this Permit, use of any access route to the Permit activities, or Applicant Organization's exercise of the rights granted by this Permit, except those arising out of the sole negligence or willful misconduct of the California Department of Parks and Recreation or its employees.

Indemnity Agreement

Applicant Organization hereby agrees to comply with the following (initial appropriate section) indemnity agreement:

X ***Standard Applicant (select this section unless a Federal Applicant or University of California Applicant)***

Applicant Organization agrees to be responsible for damages to persons or property caused by negligent acts or omissions of its employees acting within their scope of employment. Applicant Organization shall protect, save, hold harmless, indemnify, and defend the State, its officers, agents, and/or employees, from and against any and all loss, damage, claims, demands, liability, costs, recoveries, settlements, penalties, fines and expenses, including, without limitation, all legal fees, attorney fees, accounting fees, expert witness fees, consultant fees, interest and expenses related to the response to, settlement, and/or defense of any claims, legal actions, or liability, which may be suffered or incurred by the State, its officers, agents and/or employees, caused by, arising out of, or in any way connected with this Permit, use of any access route to the Permit activities, or Applicant's exercise of the rights granted by this Permit, except those arising out of the sole negligence or willful misconduct of the State. The obligations contained in this Section, including the waiver and indemnity obligations, shall survive termination of this Permit.

_____ ***Federal Applicant***

Federal Applicant agrees to be responsible for damages to persons or property caused by the negligent acts or omissions of Federal employees acting within the scope of their employment in accordance with the Federal Tort Claims Act, codified at 28 USC 2671 et seq. If found liable in a federal court of competent jurisdiction, the Federal Applicant agrees to pay attorneys' fees to the extent permitted under federal law. To the extent allowable by Federal law, Federal Applicant shall defend the State and its employees from claims arising from the permit activities, except those arising from the sole negligence or willful misconduct of the State or its employees.

_____ ***University of California Applicant***

University of California Applicant agrees to be responsible for damages to persons or property caused by negligent acts or omissions of its employees acting within their scope of employment. THE REGENTS OF THE UNIVERSITY OF CALIFORNIA shall defend, indemnify and hold THE STATE OF CALIFORNIA AND ITS AGENCIES, their respective officers, employees and agents harmless from and against any and all liability, loss, expense, attorneys' fees, or claims for injury or damages arising out of the performance of this Agreement but only in proportion to and to the extent such liability, loss, expense, attorneys' fees, or claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, its officers, agents, or employees.

THE STATE OF CALIFORNIA shall defend, indemnify and hold THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, its officers, employees and agents harmless from and against any and all liability, loss, expense, attorneys' fees, or claims for injury or damages arising out of the performance of this Agreement but only in proportion to and to the extent such liability, loss, expense, attorneys' fees, or claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of THE STATE OF CALIFORNIA OR ITS AGENCIES, their respective officers, agents, or employees. (1988 UC/ DGS Agreement)

I hereby certify that I am a representative of Applicant Organization authorized to agree to the above indemnification requirements of this permit.

AUTHORIZED REPRESENTATIVE SIGNATURE	PRINTED NAME	DATE
▶ Ian Wren	Ian Wren	Feb 1, 2024

PERMIT TO CONDUCT SCIENTIFIC RESEARCH AND COLLECTIONS

SPECIAL CONDITIONS

FOR DEPARTMENT USE (REVIEW/APPROVAL)

REVIEWED BY ▶	DISTRICT ENVIRONMENTAL SCIENTIST	DATE
REVIEWED BY ▶	DISTRICT SUPERINTENDENT / MANAGER	DATE
DPR APPROVAL SIGNATURE* ▶	PRINTED NAME / TITLE	DATE
OTHER DPR APPROVAL SIGNATURE (OPTIONAL)* ▶	PRINTED NAME / TITLE	DATE

**NOTE: If all park units in single DPR District, Superintendent has approval authority. For more than one DPR District, Natural Resources Division EPM must approve.*

PERMIT VALID FROM:_____ TO:_____

IAN WREN

P.O. Box 31896, San Francisco, CA 94131 | 415.810.6956 | ian@wrenws.com

EXPERIENCE

INDEPENDENT CONSULTANT **2016 – Present**

Project management support for the City of San Leandro to design, permit, fundraise for, and construct a multi-benefit treatment wetland for water quality improvement, habitat restoration, and sea level rise adaptation. (2018 to present)

Grant writing for the City of Palo Alto (Measure AA), San Francisco Estuary Partnership (EPA's SF Bay Water Quality Improvement Fund), and Oro Loma Sanitary District (SF Bay Water Quality Improvement Fund).

Technical expert services, on behalf of several non-profit organizations, to perform technical and expert witness services related Clean Water Act enforcement matters. Services include sample collection, preparation of sampling procedures and quality assurance protocols, preparing pollution prevention and monitoring plans, negotiating technical details of settlements, and assisting with compliance determinations.

Project manager and technical lead for a $500k examination of Nature-based Solutions for Wastewater Treatment, on behalf of the Bay Area Clean Water Association (BACWA) and San Francisco Estuary Institute (SFEI). (2019 to present)

Program coordinator and technical consultant to the SF Bay Nutrient Management Strategy (NMS), a multi-stakeholder effort to assess nutrient condition, inform regulations, and assist nutrient management efforts. (2016 to present)

- Implement and manage administrative and stakeholder engagement efforts on behalf of the NMS Steering Committee and help establish the strategic vision for nutrient assessment and management efforts in the Bay Area.
- Engage with and present to regional experts in the wastewater sector, academia and regulatory agencies on technical and policy-related matters related to governance, science and management of nutrients in SF Bay.
- Developed a regional scenario analysis for 37 Bay Area wastewater facilities to inform green infrastructure-based approaches to water quality improvement, regulatory compliance and sea level rise adaptation.
- Produce grant proposals to advance nutrient science and management efforts, including a $600k Measure AA proposal on behalf of the San Leandro Water Pollution Control Plant to develop green infrastructure options for nutrient reduction.

SAN FRANCISCO BAYKEEPER | Oakland, CA **2010 – Present**

Staff Scientist (part-time)

Provide scientific and policy leadership for an effective non-profit focused on water quality and habitat protection of San Francisco Bay. Translate science and water quality data into pragmatic approaches for SF Bay water quality improvement.

- Served as an in-house hydrology expert in over 50 Clean Water Act enforcement lawsuits, requiring sampling design, analysis and hydrologic/hydraulic modeling, negotiation and mediation in federal court, design and oversight of post-construction BMP implementation, as well as review and revisions to NPDES permits and management plans.
- Determine strategic direction in collaboration with Board members, technical leaders and staff to focus limited resources.
- Spearhead advocacy direction for a range of regulatory and scientific focus areas, including but not limited

to, nutrient management, contaminants, sea level rise adaptation, habitat protection, and stormwater management.

- Routinely present at regulatory hearings and a representative on a number of committees regarding various SF Bay water quality issues and policies, including SFEI's Technical Review Committee and the SF Bay NMS Steering Committee.
- Grant writing, project management and implementation of projects funded through NOAA, Google and other donors.
- Developed web-based tools and models to assess regulatory compliance and water quality trends, to facilitate in-house management for thousands of Clean Water Act compliance assessments, leading in part to a doubling of programmatic staff.

SKM ENVIROS (now part of Jacobs) | London, UK **2007 – 2010**
Environmental Hydrologist

Environmental Hydrologist and Project Manager within a UK-based international consultancy.

- Managed and implemented projects throughout the UK and portions of the Middle East in the real estate, oil refining, wind energy, and public sectors pertaining to water quality, aquatic ecology, flood risk, wetland restoration, European Union policy, sustainable urban drainage, and sea level rise adaptation design.
- Led business development efforts for hydro-ecological services, gaining entry to prized regulatory agency contracts and other public sector contracts.
- Management or implementation of high-profile projects, such as a green roof evaluation for 2012 London Olympics sites; construction management of the Qatar Petroleum's Doha-based headquarters; year-long assessment of bacteria impaired shellfish fisheries, pursuant to European Directives, including water quality modeling and assessment of potential mitigation and estuarine restoration options; and estuarine plume modeling for SE England's largest oil refinery.

ATKINS | London, UK **2007**
Environmental Hydrologist

Led a consulting project involved monitoring, modeling and reporting of nutrient and sediment transport on behalf of major wastewater agencies in Southeast England, in preparation for regulations associated with the EUs Water Framework Directive.

SAPPHOS ENVIRONMENTAL | Pasadena, CA **2004 – 2006**
Resource Management Consultant and Habitat Restoration Specialist

Project manager and technical specialist in a fast-paced environmental consulting firm. Roles included development, assessment and oversight of aquatic and terrestrial habitat restoration and resource management projects for several high-profile clients, including LAX, Caltrans, Metropolitan Water District, and wind developers.

- Development and negotiation of multi-stakeholder agreements for wetland, stream and terrestrial restoration projects
- Prepared wetland and ecological documents pursuant to CWA, CEQA/NEPA, state/federal ESA, and other regulations.
- Led federal Endangered Species Act consultations for terrestrial and wetland wildlife throughout Southern California
- Primary client was City of Los Angeles, involving habitat, water and wetland-related compliance for the multi-billion dollar LAX Master Plan project, involving complex regulatory compliance negotiations, management of multi-million dollar mitigation and restoration projects, and multi-stakeholder mediation.

Prior Experience

Staff Research Associate, UC Los Angeles Dept. of Public Health, 2003 – 2004

Staff Research Assistant, UC Berkeley Dept. of Environmental Science, Policy and Management, 2000 – 2003

EDUCATION

MSc, *Hydrology*, School of Civil and Env. Engineering, Imperial College of Science Technology and Medicine, UK, 2007

BA, *Integrative Biology*, UC Berkeley, 2002

PROFESSIONAL AFFILIATIONS AND TRAININGS

San Francisco League of Conservation Voters – Board Member and Treasurer, 2012 – Present

Several stormwater and hydrological professional credentials (CPSWQ, QISP, QSP)

Completion of 38-hour Army Corps of Engineers Wetland Delineation Training

RECENT PUBLICATIONS

Neethiling, J. B., et al. 2022. Guidelines for Optimizing Nutrient Removal Plant Performance: Final Report, WRF Project #4973. Prepared on behalf of the Water Research Foundation. (My input involved the role of nature-based solutions for nutrient management in the wastewater context.)

Beck, M. W., de Valpine, P., Murphy, R., Wren, I., Chelsky, A., Foley, M., & Senn, D. B. (2022). Multi-scale trend analysis of water quality using error propagation of generalized additive models. Science of the Total Environment, 802, 149927.

Harris-Lovett, S., Bradt, J., Juvera, L., Nutters, H., and Wren, I. Nature Based Solutions for Coastal Resilience, Habitat Enhancement, and Water Quality Improvement at the San Francisco Bay Shoreline: Challenges, Solutions, and Next Steps. San Francisco Estuary Partnership and Bay Area One Water Network. (2022).

Wren, I. F., Plane, E., Beagle, J., Senn, D.B. Nature-based Solutions for Nutrient Removal, Opportunities & Constraints Analysis. (2021). Prepared on behalf of the Bay Area Clean Water Agencies.

M. Falk, M., Neethling, J.B., Wren, I., Fono, L., Mumley, T., Kennedy, H. (2021). A Watershed Based Approach for Managing Nutrients in San Francisco Bay. Proceedings of the Water Environment Federation, USA, October 2021.

Wren, I. F. Treatment Wetlands for Nutrient Removal from Bay Area Wastewater Facilities: Screening Level Opportunities and Constraints Analysis. (2017). Prepared on behalf of the San Francisco Bay Nutrient Management Strategy.

Several technical documents and opportunities and constraints memoranda focused on nature-based solutions for nutrient removal at Bay Area wastewater facilities. (2022)

Dozens of reports developed in my capacity as a consultant or expert witness in Clean Water Act enforcement cases.

Water, Sediment, Biofilm, and Biota Sampling in Lake Tahoe, California

Quality Assurance Program Plan & Sampling and Analysis Plan

Prepared by Ian Wren

Version 1.0

January 2024

Table of Contents

1. TITLE AND APPROVAL

1.0 Quality Assurance Project Plan

Project Title: Water and Sediment Sampling in and around Emerald Bay, Lake Tahoe, California

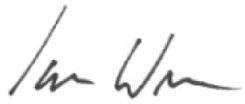
Version 1.0

Date: January 31, 2024

Responsible Party: Ian Wren

Approval Signatures:

Ian Wren Date



January 31, 2024

1.1 Distribution List

TABLE 1. DISTRIBUTION LIST

TITLE	NAME	AFFILIATION	TEL. No.
Principal Investigator; Project Manager & QA/QC Officer	Ian Wren	Independent consultant	415-810-6956

2. PROJECT ORGANIZATION

2.0 Involved Parties and Roles.

The California Sportfishing Protection Alliance (CSPA) serves as the client for this sampling program. CSPA is responsible for data collection and quality control for this Quality Assurance Program Plan (QAPP) and Sampling and Analysis Plan (SAP).

Ian Wren will serve as Principal Investigator and Project Manager responsible for the implementation of this Quality Assurance Program Plan ("QAPP") as well as making decisions on project, program, and plan details. He is a consultant for CSPA. Mr. Wren will supervise the tasks to be performed and resolve any issue of concern.[1] Mr. Wren will also serve as the Field Team Leader, providing direction on field sampling logistics, personnel assignments, and field operations. Specifically, Mr. Wren will undertake on his own or supervise all field collection and testing activities and maintain responsibility for ensuring accurate sample positioning, recording sample location and identification, ensuring conformity to sample handling, processing and testing requirements, and chain of custody through delivery to the analytical laboratory. He will also ensure that collected samples are stored under proper condition until analysis or delivery and be responsible for documenting field sampling activities or instructing others to do so.

The individuals identified below shall be a point of contact with the laboratories responsible for generating analytical data, in accordance to approved laboratory methods.[2] Any laboratory problem regarding this project will be addressed to those individuals identified in Table 2.

TABLE 2. CONTRACT LAB CONTACTS

ROLE	NAME	AFFILIATION	Contact Information
President	Todd Albertson	Caltest Analytical Laboratory, 1885 North Kelly Rd. Napa, CA 94558,	(707) 258-4000 Todd_Albertson@caltestlabs.com
Client Relations	Jennifer Timmons	Eurofins-Tustin, 2841 Dow Ave, Suite 300, Tustin, CA 92780	623-298-1040 Jennifer.Timmons@et.eurofinsus.com
Professor	Sudeep Chandra	University of Nevada, Reno –Global Water Center, 1072 Evans Street, Reno, NV 89512,	(775) 682-6066 sudeep@unr.edu
Lab Contact	Leif Abrell Mary Kay Armistadi	University of Arizona Arizona Laboratory for Emerging Contaminants (ALEC) Gould-Simpson Building, Rooms 828, 848, 1040 East 4th Street, Tucson, AZ 85721	520-488-7475 o-ALEC@arizona.edu 520-626-9965 i-ALEC@arizona.edu

[1] Ian Wren possesses a wealth of expertise in crafting and executing quality assurance strategies and sampling initiatives. Holding a Master of Science in Hydrology and a Bachelor of Arts in Integrative Biology, he brings over 15 years of dedicated experience in the development and implementation of quality assurance and sampling programs.

[2] Analytical services may also be conducted at other appropriate laboratories certified by ELAP. Any changes in the choice of laboratory will be duly updated in this Quality Assurance Project Plan/Sampling and Analysis Plan (QAPP/SAP).

Ian Wren will also serve as the Quality Assurance Officer for this project. He will provide quality assurance oversight for both the field sampling and laboratory programs. He will be kept fully informed of field program and laboratory activities during sample preparation and analysis. He will identify, record and correct any activities that vary from the QAPP.

2.1 Persons responsible for QAPP update and maintenance.

Changes, corrections and updates to this QAPP may be made after a review of the evidence by the Project Manager and Quality Assurance Officer (Ian Wren). As the Project Manager and Quality Assurance Officer, Mr. Wren will be responsible for making the changes and signing a final version of this QAPP and SAP.

3. PROJECT BACKGROUND AND TASK DESCRIPTION

3.0 Problem statement

This QAPP and its accompanying Sampling and Analysis Plan (SAP), provided as Appendix A, have been created to guide the process of collecting and analyzing water, algal and bacteria (here after referred to as biofilm), invertebrates, fishes, and surface sediment samples. This effort serves to inform condition assessments and discharge points in and around submerged telecommunications cables located in Lake Tahoe (California side) near or within Emerald Bay.

3.1 Decisions or outcomes

Water, biofilm, invertebrates, fishes, and sediment sampling for lead (Pb), hardness, and field measurements is intended to answer the general questions: Are elevated Pb concentrations found in water and sediment near submerged cables in Lake Tahoe? Is the biota or the biology of the lake (e.g., biofilms, invertebrates and fishes) inhabiting waters around the submerged telecommunications cables accumulating lead or other metals?

3.2 Work statement and produced products

This Sampling Program will include the collection of individual water, biofilm, biota and/or sediment samples for analysis of Pb and hardness. Field measurements shall be collected in water to document nearby and ambient conditions around the submerged telecommunications cables. Samples will be collected in close proximity (one inch or closer for water samples and less than 4 inches for sediment samples) to submerged telecom cables as well as from reference sites located approximately fifty (50) feet away from the submerged cables.

One (1) water quality and one (1) surficial sediment (1 cm or less) sample shall be collected at each general location, coinciding with the location of frayed, worn, defective or damaged cables and from a reference site 60-100 feet from the cable. One (1) water and one (1) sediment sample shall be collected at a reference site for every three (3) specific sampling locations along the cable. One (1) biofilm sample will be taken if present on the cable or within 6 inches of the location of the frayed,

worn, defective, broken or damaged portion of the telecom cables and 60-100 feet away from the cable.

Biota, including bivalves, freshwater crustaceans, or other invertebrates will be collected opportunistically. Fish will be collected by placing a baited minnow trap overnight near the cable and away from the cable in similar locations where water and sediment samples are collected.

3.3 Constituents to be sampled and measurement techniques.

Table 4 lists the parameters for analysis from each sampling station. The sampling procedures for each station are detailed in the accompanying Sampling and Analysis Plan ("SAP") in Appendix A.

TABLE 3. SUMMARY OF SAMPLING PARAMETERS

Parameter	Sampling Frequency per Wet Season	# samples per Monitoring Station	Notes
Lead (Pb) and metals in water or sediment	Discrete events	2	One (1) water sample and one (1) sediment sample shall be collected from each location near the cable. The water volume collected shall be split for analysis of total and dissolved metals. The dissolved water portion shall be field-filtered within 15 minutes of sample collection. A set of reference samples (water and sediment) will be collected 60-100 feet away from every three (3) sampling locations along the submerged cable.
Pb in biota (e.g., crustaceans, bivalves, fish)	opportunistic		
Total Hardness in water	Coinciding with water & sediment sampling for Pb	1	Analyzed from the bottle containing the water sample for total Pb
Temperature	coinciding with bacteria & nutrient sampling	1	Measured from the boat of ambient water in the vicinity of each sampling location with a calibrated YSI Pro1030 meter
pH		1	
Specific conductance		1	

General Water Quality Measurements

A YSI Pro1030 multi-parameter probe and meter shall be used to measure field parameters, including temperature, pH, and specific conductance. Prior to each day of sampling, the probe shall be calibrated according to manufacturer's specifications (Appendix B). Calibrations for pH shall rely on at least three standards (4, 7, and 10) and calibrations for specific conductivity shall use at least two calibration standards.

Measurements shall be recorded from the support boat at each sampling location, using a multi-parameter probe with a cable of sufficient length to measure ambient conditions close to the sampling locations in proximity to the submerged cables. Location, time, and depth of

measurement shall be recorded at each sampling location. Instruments shall be handled with care and transported in a hard-shell case.

Metals Sampling

During specific sampling events, the assigned field team will gather water and sediment samples to test for metals including lead (Pb) and other specified substances. Divers will carry out this sampling with support from a team on a nearby boat.

As detailed in Appendix A, the method involves carrying capped or plugged syringes or needles to a sample location, carefully approaching the cable to avoid and/or minimize disturbing sediment, uncapping or unplugging the syringe or needle within six (6) inches or less of the cable, and directly fillings syringes or needles with water samples at one (1) inch or closer to the cable.

Biofilm will be collected from the cable surface using a double syringe and brush method, as described in the scientific literature to dislodge and collect periphyton and other algae from hard surfaces in Lake Tahoe for subsequent analysis (Appendix C).[3] To assess Pb concentrations in algae or other aquatic vegetation fixed to the submerged cables, some material may be manually removed for collection. The amount removed should be minimal, less than what would fill a 4-ounce jar, to ensure minimal impact on aquatic life.

Surface sediment shall be collected as close to the underwater cables as possible (at a distance of no more than 4 inches in lateral distance from the cable and at a depth of less than one inch). Invertebrates will be collected on an opportunistic basis based on observations from each location and 60-100 feet distance from a cable. Fishes will be collected by placing a minnow trap overnight in a location near the cable and 60-100 feet from the cable.

Water samples shall be divided to test for total and dissolved metals. The portion for dissolved metals analysis will be field-filtered within 15 minutes of sample collection directly into containers that already contain preservatives. These samples will be stored in a cooler and transported to California Laboratory Services in Rancho Cordova, CA, adhering to the required hold time limits.

3.4 Project Schedule

Sampling in D.L. Bliss and Emerald Bay State Parks will occur once a permit from the California Dept of Parks and Recreation is obtained. Sampling outside the referenced State Parks may occur in February to April 2024, depending on a number of factors, (e.g. safe boating and lake conditions). It is anticipated that the total duration of sampling will range from five to ten days, contingent on the quantity of samples that need to be collected.

3.5 Geographic setting

Multiple sampling locations have been identified by the Project Manager and Quality Assurance

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[3] Loeb, Stanford L. 1981. *An in situ method for measuring the primary productivity and standing crop of the epilithic periphyton community in lentic systems*. Limnol. Oceanogr. 26:2 p 394-399.

Officer after reviewing videos taken by a remotely operated underwater vehicle and photographs of the underwater cables in and around Emerald Bay, Lake Tahoe, CA. The approximate location of each cable segment is summarized in Table 4. Samples will be collected from the vicinity of the twenty-nine (29) locations identified in Table 5, which correspond to documented sampling locations from prior investigations. Approximately 20-30 sampling sites shall be identified and selected based on field investigations. The GPS coordinates of each sampling location shall be recorded at the time of sampling.

TABLE 4. APPROXIMATE GPS COORDINATES OF EACH SUBMERGED CABLE

Cable Segment ID	Approximate lat/lon of southern endpoint	Approximate lat/lon of northern endpoint
Cable A	38.9642150, -120.0814491	38.9648201, -120.0835961
Cable B	38.9439694, -120.0691341	39.0094488, -120.1131112
Cable C	38.9610501, -120.0838708	38.9647825, -120.0906788
Cable D	38.9612561, -120.0845181	38.9643928, -120.0900734

TABLE 5. APPROXIMATE GPS COORDINATES OF EACH SAMPLING LOCATION

Approximate lat/lon of anticipated sampling locations	Approximate lat/lon of anticipated sampling locations
38.964002, -120.081705	38.955761, -120.077949
38.965592, -120.083782	38.968295, -120.085222
38.965256, -120.083466	39.009596, -120.112947
38.965323, -120.083591	38.950667, -120.076741
38.965002, -120.083916	38.944747, -120.069077
38.965471, -120.083593	38.994135, -120.094512
38.963843, -120.081777	38.955832, -120.078109
38.950663, -120.076719	39.000295, -120.099309
38.963733, -120.081636	39.009556, -120.112389
38.963835, -120.083275	38.973694, -120.094194
38.961528, -120.083950	38.967528, -120.084028
38.961480, -120.083417	38.96575, -120.084222
38.993416, -120.094257	38.963861, -120.081889
38.965261, -120.083468	38.955694, -120.077917
38.979308, -120.093681	

3.6 Constraints

Severe weather conditions (wind rain and snow) can pose a risk to the safety of the sampling team and might affect the scheduled sampling activities. Similarly, severe weather could hinder the collection of representative samples because of increased turbidity caused by wind and currents. If

such weather conditions occur, the sampling will be postponed and rescheduled.

4. QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Data quality indicators (DQIs - i.e., precision, bias, representativeness, completeness, comparability, resolution, and sensitivity), data quality objectives (DQOs), and criteria for measurement data are outlined below.

4.0 Data Quality Objectives

Data Quality Objectives (DQOs) are established to ensure that data collected are sufficient and of adequate quality for the intended use. DQOs include both quantitative and qualitative assessment of the acceptability of data. The qualitative goals include representativeness and comparability, and the quantitative goals include completeness, sensitivity (detection and quantization limits), precision, accuracy, and contamination. DQOs are described in narrative form in Tables 5 and 6.

Field measurements shall be consistent with instrument requirements for precision, accuracy, and resolution established by the Surface Water Ambient Monitoring Program (SWAMP).[4]

Deviations from these objectives shall be documented in a synthesis report.

TABLE 6. DATA QUALITY INDICATORS

DQI	Definition	Method of Determination
Precision	An evaluation of agreement among replicate measurements of the same property under similar conditions; also referred to as random error or measurement variability and usually expressed as standard deviation, variance, percent difference, or range, in either absolute or relative terms	Precision measurements will be determined on laboratory replicates.
Bias	The systematic or persistent distortion of a measurement process resulting in error in one direction	Measurement of materials with a known concentration (e.g., performance evaluation or reference materials), analysis of matrix spikes, or the use of laboratory control samples
Accuracy	A measure of the closeness of an individual measurement to a known or reference value; includes a combination of random error (precision) and systematic error (bias) components of both sampling and analytical operations	Accuracy will be determined by measuring one or more certified reference materials or standard reference materials. Additional analyte recovery measurements may be made by laboratory spiking of a replicate sample with a known concentration of the analyte. The target level of addition is targeted to be at least twice the original sample concentration.
Representativeness	A qualitative measure of the degree to which data accurately and precisely represent a characteristic of a population parameter	Evaluation of whether a sample that is collected and then processed and sub-sampled by the laboratory is proportionately representative of

[4] California State Water Resources Control Board. 2013. SWAMP Field Measurements for In-Situ Water Quality Monitoring in Fresh and Marine Water. Available at https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/mqo/field_measurements_for_in-situ_fresh_and_marine_water.pdf

DQI	Definition	Method of Determination
		some predefined population characteristic or property. As such, representativeness is an —objective-defined parameter (e.g. total concentration versus dissolved concentration versus bioavailable concentration)
Completeness	An evaluation of the amount of data needed to be obtained from a measurement system; expressed as a percentage of the number of measurements that should have been collected or were planned to be collected	Under ideal circumstances, the objective is to collect 100% of all field samples desired, with successful laboratory analyses on 100% of measurements (including QC samples). However, circumstances surrounding sample collections and subsequent laboratory analysis are influenced by numerous factors, including weather, shipping damage or delays, sampling crew or lab analyst error, and QC samples failing DQOs. An overall completeness of greater than 90% is considered acceptable.
Sensitivity	The capability of a method or instrument to discriminate the parameter of interest at the level of interest. Terms sometimes used to describe sensitivity include Method Detection limit (MDL), Limit of Detection (LOD), and Limit of Quantitation (LOQ)	Method sensitivity is measured as the method detection limit ("MDL"). These limits are sensitive enough to resolve biologically relevant differences in ambient chemical concentrations and for comparison against water quality objectives and drinking water standards.
Resolution	The capability of a method or instrument to recognize small differences between values. This term is often used to assess if an instrument or method is useful to a study.	Provided by the instrument manufacturer.[5]

4.1 Quality Control for Field Measurements

Quality control requirements for field measurements are listed in the SWAMP supplemental titled Quality Control and Sample Handling Tables for Field Measurements in Fresh and Marine Water.[6] Requirements for those parameters relevant to this project are listed in Table 6. Note that pre-sampling calibration checks are required to follow manufacturer's specifications, which are provided in Appendix B. Calibrations for specific conductance and pH shall be carried out prior to and after each sampling event.

TABLE 6 QUALITY CONTROL: FIELD MEASUREMENTS IN FRESH AND MARINE WATER

Water Quality Parameter	Recommended Device	Units	Resolution	Instrument Accuracy Specs	Points per Calibration	Allowable Drift
pH	Electrode	pH	0.01	±0.2	2	±0.2 units
Specific Conductance	Conductivity cell	µS/cm	1	±0.5%	Per manufacturer	±10%
Temperature	Thermistor or bulb	°C	0.1	±0.15	Per manufacturer	±0.5

[5] The YSI Pro1030 meets or exceeds all applicable resolution requirements for field measurements associated with this project.
[6] Available at: https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/mqo/fld_msmt_water.pdf

4.2 Corrective Action: Field Measurements in Fresh and Marine Water

The YSI Pro1030 instrument should be recalibrated following manufacturer cleaning and maintenance procedures. If measurements continue to fail measurement quality objectives, affected data should not be reported and the instrument should be returned to the manufacturer for maintenance. All troubleshooting and corrective actions should be recorded in calibration and field data logbooks.

5. SPECIAL TRAINING NEEDS AND CERTIFICATION

5.0 Specialized training or certifications.

No formal, specialized training or certification is required for this project, except for being a certified diver. Dive Guide, scuba instructor and ADCI mixed gas commercial diver, Kristofer Kierce, has extensive knowledge and familiarity with conducting underwater sample collection. Ian Wren will participate in sample collection, labeling and organizing efforts and support the dive team on the boat. Before each sampling begins, every member of the field crew will be instructed by the Project Manager on: (1) personal health and safety while in the field; (2) field and lab paperwork protocols; (3) sample collection methods; and (4) sample transport and hold-time protocols.

6. DOCUMENTS AND RECORDS

The following documents, records, and electronic files will be produced:

- QAPP (paper and electronic formats)
- Sampling and Analysis Plan (paper and electronic formats)
- Field Sampling Sheets (internal documentation available upon request)
- Chain of Custody (COC) Forms (exchanged for signatures with chemistry lab and kept on file) – Refer to Appendix D for a blank form

Copies of this QAPP will be distributed by the Project Manager to all parties directly involved in this project. A video training session will occur prior to the initial sampling event. Refresher training will occur before subsequent sampling events. Project Manager will provide additional training as needed through sampling events. Any future amended QAPPs will be distributed in the same fashion. All originals of the first and subsequent amended QAPPs will be held by Ian Wren in electronic format. Paper copies of versions, other than the most current, will be discarded so as not to create confusion.

All laboratory logs and data sheets will be maintained by Ian Wren for a minimum of five years following project completion. Water and sediment samples not used for laboratory analysis shall be stored by the lab until authorized to dispose of the remaining sample material. A synthesis of document and record retention information is contained in Table 7.

TABLE 7. DOCUMENT AND RECORD RETENTION, ARCHIVAL, AND DISPOSITION INFORMATION

	Identify Type Needed	Retention	Archival	Disposition
Sample Collection Records	Field sampling form	Ian Wren	Digital	5 years
Field Records	Photo logs & photos	Ian Wren	Digital	5 years
Analytical Records	Chain of Custody	Ian Wren	Digital	5 years
Analytical Records	Calibration Log	Ian Wren	Digital	5 years
Analytical Records	Chemical Results	Ian Wren	Digital	5 years

7. SAMPLING PROCESS DESIGN

This monitoring program follows a deterministic approach where sites are targeted for sample collection. The targeted design strategy for this project is to collect representative water and sediment samples and field data along segments of the submerged cables and at least one (1) reference sample for every three (3) samples along the cables. Sampling procedures shall follow the Standard Operating Procedures (SOPs) contained in Appendix A.

7.0 Site Selection

The sampling site were selected based on the following criteria:

- Safe access;
- Sample shall be representative of location in proximity to locations where the cables are frayed, torn, defective, broken or damaged, or in areas where the lead-containing cables are suspected to be discharging lead into a source of drinking water;
- Location complements or supplements available data; and
- Sampling locations should generally be on the downwind side of the cables to minimize sediment and water disturbance.

Every location selected for sampling must be appropriate for a certified diver to conduct the work. The preliminary sampling sites are outlined in Table 4. However, the feasibility of sampling at these sites could be limited due to various factors like weather, water depth, accessibility, and safety concerns. Throughout the project, if any chosen location becomes unsuitable for sampling as originally planned, Ian Wren will identify a different site that continues to be relevant to the project's interests. Any modifications in the sampling locations will be documented through updates to this QAPP.

7.1 Sample Handling and Custody

Sample containers shall be obtained from the contract lab, which are cleaned and prepared by the lab or are factory pre-cleaned. Each container will be given a permanent sample label written in

waterproof ink. At a minimum, each sample label will include the station name and code, sample date, Lab identification (ID), analysis required, preservative (if present) and collector's initials. A summary of sample containers, volume, preservation and storage requirements for water quality samples are provided in Table 8.

It is critical that sample contamination be avoided during collection. Sampling personnel will wear powder-free nitrile gloves whenever taking or processing samples to avoid contact contamination. In addition, cross-contamination is avoided by keeping sample containers appropriately capped, plugged and/or covered when not in use.

Samples will be hand-delivered in insulated coolers.

All samples will be handled, prepared, transported, and stored in a manner to minimize bulk loss, analyte loss, contamination, or biological degradation. Sample containers will be clearly labeled with an indelible marker.

The receiving laboratory has a sample custodian who examines the samples for correct documentation, proper preservation, and holding times. In this study, sample collection will be done by divers and Ian Wren, so samples will not change custody between field collection and submission to the laboratory for storage and analytical testing. For all samples transported by Ian Wren to other labs, temperature will be checked at the receiving lab.

All samples remaining after successful completion of analyses, if any, should be retained during the pendency of the matter of CSPA v. Pac Bell, pending laboratory constraints. Remaining ample material shall be disposed of properly only after written confirmation from PM, Ian Wren.

It is the responsibility of the personnel of each analytical laboratory to ensure that all applicable regulations are followed in the disposal of samples or related chemicals.

Project Chain of Custody (COC) procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal for analytical results. A complete COC form is to accompany the transfer of samples to the analyzing laboratory and to be forwarded to the PM, Ian Wren, with the data reporting package. The COC form shall be provided by the analyzing laboratory in advance of sampling.

TABLE 7. SAMPLING PARAMETERS, HANDLING AND HOLD TIMES

Sample Location	Parameters for Analysis	Holding Time	Containers/Typical Sample volume	Preservation Chemical/Temperature
All	Pb in water (total & dissolved)	180 days	250-mL HDPE	HNO_3 /ice, dark
All	Pb in sediment[7]	28 days	4-oz glass jar w/Teflon lid	none
All	Hardness	180 days	250-mL HDPE	HNO_3 /ice, dark

[7] Split samples shall be collected for each sediment sample and preserved by the lab for potential Toxicity Characteristic Leaching Procedure (TCLP) and Synthetic Precipitation Leaching Procedure (SPLP)

7.2 Analytical Methods

A list of analytical methods is listed Table 9.

TABLE 8. ANALYTICAL METHODS

Analyte	Laboratory[8]	Project Reporting Limit (RL)	Project Method Detection Limit (MDL)	Analytical Method/SOP
Pb in water	CA Laboratory Services	1.0 µg/L	0.118 µg/L	EPA 6020 / 200.8
Pb in sediment	CA Laboratory Services	0.02 mg/kg	0.003 mg/kg	EPA 6010B / 6020
Total Hardness	CA Laboratory Services	1.0 mg/L		200.7

7.3 Instrument/Equipment Testing, Inspection and Maintenance

Laboratory Equipment

The laboratory will maintain appropriate equipment per the requirements of individual laboratory SOPs and Environmental Laboratory Accreditation Program (ELAP) Certification requirements. Evidence of compliance with applicable SOPs, documenting their ability to conduct the analyses with the required level of data quality, is available upon request. Such information might include results from inter-laboratory comparison studies, control charts and summary data of internal QA/QC checks, and results from certified reference material analyses.

7.4 Inspection/Acceptance of Supplies and Consumables

All supplies and containers used in this study will be either certified for cleanliness from the contract laboratories, or thoroughly inspected prior to use (e.g., sampling gloves and equipment). Laboratories will determine that all supplies and consumables comply with acceptance criteria outlined in their SOPs prior to conducting analyses.

Project PM shall be responsible for ensuring compliance with the acceptance criteria defined in Table 10.

TABLE 9. INSPECTION/ACCEPTANCE TESTING REQUIREMENTS FOR CONSUMABLES AND SUPPLIES

Project- Related Supplies / Consumables	Inspection / Testing Specifications	Acceptance Criteria	Frequency	Responsible Individual
Sample bottle, syringes, filters	Sealed, clean, proper type	Accept if sealed	On delivery	Ian Wren

[8] Analytical services may also be conducted at other appropriate laboratories certified by ELAP. Any changes in the choice of laboratory will be duly updated in this Quality Assurance Project Plan/Sampling and Analysis Plan (QAPP/SAP).

8. DATA MANAGEMENT

8.0 Data Handling from Field to Office

For each sampling event, Ian Wren will record field observations and sample collection details. Ian Wren will also use Chain of Custody forms provided by the contract lab. Original forms will be reviewed for completeness by the Project Manager upon completion of any sampling event. Any missing information will be filled in if possible or flagged for remedial action. When the contract lab submits their data and QC reports, the QA Officer will review the reports carefully to see that the required matrix spikes, duplicates and all other required QC procedures were conducted as required. Any deviations from the QC guidelines will be documented and reported to the Project Manager, who will tag the data related to the problem as not meeting standards or will have the questionable processes redone if possible.

Data received from the contract laboratories will be transferred to Ian Wren in electronic format.

8.1 Standard Record-Keeping and Tracking Practices

All records will be inspected by the Project Manager upon receipt. After the data is judged to be correct it will be entered immediately and original electronic copies shall put on file by Ian Wren. A record of all documents received from the field and contract labs will be kept with the date received and where the document was generated.

8.2 Processing, Compiling, Analyzing and Transmitting Data Reliably

The Project Manager will perform the data input. After entry into the project spreadsheet, the data will be analyzed to ensure consistency with applicable DQIs.

9. ASSESSMENT AND OVERSIGHT

9.0 Assessments and Response Actions

The project will be assessed continuously by the Project Manager and through its adherence to the timeline and the completeness and accuracy of the data collected. All raw and statistical analysis data are subject to a 100% check to ensure satisfaction of QC criteria by the PM, who in turn has the authority to issue stop work orders if needed. Data are analyzed and proofread for accuracy and completeness by the Project Manager, and then QA checked before being entered into the project spreadsheet by the Project Manager. Electronic copies are stored and backed up.

If corrective action is warranted after the PM has performed QA/QC review of the sampling data, a subcontracting analytical laboratory may be asked to re-analyze samples that did not meet expected project DQOs. Corrective actions that result from a project assessment will be documented in the reports.

9.1 Process for Corrective Action

Any corrective action found to be necessary through the QA/QC assessment process will be

documented in memo format and distributed to all other project personnel and contractors.

10. DATA VALIDATION AND USABILITY

10.5 Data Review, Verification, and Validity Requirements

Data Verification is confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Data verification is the process of evaluating the completeness, correctness, and conformance or compliance of a specific data set against the method, procedural, and/or contractual requirements.

Data Validation is confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. Data validation is an analyte-and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set.

Data generated from the field sampling component of this project will be reviewed by the PM/QA Officer. When warranted, reanalysis of sample material may be requested of the labs or data will be qualified appropriately.

10.6 Project Data Verification and Validation Process

All data will be checked for errors in transcription, calculation, computer input, completeness, and accuracy. As all forms and reports come in from the field and labs, the Project Manager will first check to see that the forms have been filled out completely and correctly and are legible.

Any problems that can or cannot be directly corrected at this stage will be reported and the related data flagged if necessary. The PM will also review all the labs quality control procedures to make sure all of the required quality control requirements meet calibrations, duplicates, matrix spikes, etc.

Any outliers, deviations from the requirements, irregularities or other questions will be documented by the PM and the data flagged. The PM will prepare a QA error report for inclusion in the data synthesis and summary. If issues are identified, resolution will include re-analysis or re-sampling if data quality issues cannot be resolved at the data transfer or data base level.

APPENDIX A: SAMPLING & ANALYSIS PLAN – MANUAL WATER AND SEDIMENT SAMPLE COLLECTION & FIELD DATA COLLECTION

1. INTRODUCTION

This protocol describes the techniques used to collect water samples in the field in a way that neither contaminates, loses, or changes the chemical form of the analytes of interest.

Procedures for the collection and storage of water samples are based on EPA Method 1996.[9]

Procedures for the collection and storage of sediment and bio-film samples are based on EPA technical manual EPA-823-B-01-002.[10]

Procedures for collecting field measurements are based on those developed for the Surface Water Ambient Monitoring Program (SWAMP) of the California State Water Resources Control Board.[11]

a. Summary of Method

Appropriate sample containers and field measurement gear as well as sampling gear are transported to the site where samples are collected according to each sample's protocol. Samples are collected from along a single segment of cable at each monitoring station. Samples are hand delivered in insulated coolers to the Rancho Cordova, CA laboratory of California Laboratory Services. Field parameters are measured with a YSI Pro1030 multi-parameter probe following calibration.

b. Special Cautions and Considerations; Health and Safety

Proper gloves must be worn to both prevent contamination of the sample and to protect sampling personnel from environmental hazards. The user should wear at least one layer of gloves. Sampling personnel wear powder-free nitrile gloves whenever taking or processing samples to avoid contact contamination.

Any sample collection procedures requiring underwater activity shall be performed only by a certified diver with experience in cold water conditions.

2. MOBILIZATION

In advance of sample collection, contact the laboratory to notify them of the planned activity, order the necessary sample containers and analyte-free blank water provided by lab performing the

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9 US EPA Office of Water. 1996. *Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels*.

10 US EPA Office of Water. 2001. *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual*. EPA-823-B-01-002.

11 Surface Water Ambient Monitoring Program (SWAMP) of the California State Water Resources Control Board. 2014. *Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples with Associated Field Measurements and Physical Habitat in California*. Version 1.1.

analyses for blanks, and coordinate sample preservation and analysis for analytes with short holding times. Discuss with the laboratory the planned analyses and required sample containers as specified in the QAPP.

The following is a list of equipment to be mobilized by field personnel in advance of sampling operations; field crews are able to modify this list to account for site- and event-specific conditions.

- Sampling containers with labels (refer to Table 8 of the QAPP)
- Metal-free syringes for water sample collection with Luer Lock stopcocks or slip-on caps
- 0.45 µm filtration units
- Hand-operated vacuum pump
- 1-L of blank water for field blank
- Factory cleaned transfer container
- Cooler(s)
- Cube ice, with zip-top bags for bagging
- Stainless steel bowls, spatulas and spoons
- Zip-top bags for individual sample containers – 1-gallon and 1-quart size
- Aluminum foil
- Detergent (Micro™, Liqui-Nox™, or equivalent)
- 70% ethanol or isopropyl alcohol
- Deionized water for rinsing of field equipment
- Analyte-free blank water
- Scrub brushes (minimum 2)
- Powder-free nitrile gloves
- Receptacle for collecting solid waste
- GPS
- Camera
- Cell phone
- Spare batteries and charging cords for all electronics (GPS, cell phone, camera, etc.)
- Paperwork (compiled binder of sampling plan, SOPs, COCs, datasheets, maps, etc. as required)

a. **Equipment Cleaning**

The following applies to the equipment list above:

- Disposable supplies must not be reused. This includes filters, gloves, storage bags, and ground cloths. Be sure to properly dispose of any gloves and other consumables used during sampling.
- Before each use, particularly at the start of each day, all equipment used for collecting, processing, and handling samples must be thoroughly cleaned. This is especially crucial for sediment sampling tools such as scoops, spatulas, mixing bowls, and any other utensils in contact with the samples. Clean the field equipment using a phosphate-free lab detergent, like Liquinox, and a gentle scrub brush or sponge. Wrap cleaned equipment in aluminum foil

for transfer to the field. If there's a possibility that the equipment has been contaminated prior to field use, it should also be disinfected. Suitable disinfectants include a 70% solution of either ethanol or isopropyl alcohol, which should not be used beyond 180 days from its date of preparation.

- Bottles, filters, and syringes may be used new without additional cleaning if they are certified pre-clean and metals free, and a rinsate blank is run from each lot.

- Materials should be stored and transported in dust-free containers, such as plastic bags, included in laboratory-prepared sampling kits.

3. SAMPLE COLLECTION
    a. Sample Location

All sample locations shall be pre-identified and inspected for safe and permissible access prior to sampling. Water samples shall be collected via syringe within 1.0 inch in distance of a cable segment. Sediment samples shall be collected from beneath and immediately adjacent to a given cable segment.

a. Sample Container Labels

Label each sample container with the station ID, analysis type, project ID, and date and time of collection. To the extent feasible, pre-label containers prior to sampling, as it is difficult to write on labels once they are wet.

b. Field QC for Water and Sediment Analyses

Readiness reviews, post-event sampling reviews, and field audits will be performed by the PM as part of the programmatic quality assurance program to help ensure that appropriate protocols are followed.

c. Field QC Samples

Field splits (FS) shall be collected with every tenth (10^{th}) water sample, or once per field day, to determine analytical variability. One (1) set of field equipment rinsate blanks shall also be prepared for each field day.

d. Sample Collection Methods for Pb in Water

1. Complete the pre-labeled sample containers including field station codes, sample date, and time. Identify field and/or lab duplicate samples on the label, the COC, and on the field data sheet.
2. Fill out the field data sheet completely, including any unusual sample conditions and to document the sample time, GPS coordinates (if available), and any pictures taken.
3. Use fresh/new gloves for each sampling location within each of the monitoring stations. Gloves should be kept clean during transport to the field. They should be fresh/new and only put on directly before opening the bottle for sampling. Take care not to place gloved fingers

inside sampling container and avoid touching the opening.

4. Special care should be always used to avoid contamination of the inside of the sample container and cap. It is recommended to store bottles in resealable plastic bags before collecting samples to prevent contamination.
5. Before handling sample bottles or sampling equipment the designated diver/sampler shall wear two pairs of nitrile gloves, on top of each other. The diver/sample collector shall enter the water with capped, plugged or covered syringes or needles in a resealable bag for one sample. After identifying the cable and sampling site the diver shall remove one pair of the gloves to minimize contamination between the time of entering the water and identifying the sampling location.
6. Collect your sample. Note that water samples shall be collected at each site before sediment samples to minimize site disturbance. Use appropriately-sized syringes to collect at least 500ml of water from each sample site for dissolved and total Pb from a distance of less than 1 inch in lateral distance from the cable segment. Use either a Luer Lock stopcock or slip-cover to close the syringe underwater. Each syringe shall be handed directly to the member of the boat crew or Project Manager responsible for sample processing and storage.
7. 250 ml of the sample shall be filtered with within 15 minutes of collection. Filter samples directly into their container. 250 ml of the sample shall be transferred to a plastic bottle with preservative for total metals analysis. Total hardness shall be analyzed using the total metals sample.
8. Collect field equipment rinsate blank by pouring a sample of purified water into and over any sampling container or device used in the field, directly into sample bottles, including those used for sediment samples. Preserve and transport field blanks to the laboratory with the field samples. Follow the same handling and preservation techniques as the other samples. A minimum of one field blank per field day should be obtained.
9. Double-check the sample bottle caps are tightly sealed and place bottles into double resealable plastic bags and on ice in a cooler immediately after collection.
10. The diver performing the sampling and the boat crew responsible for filtration and sample handling must change gloves after each sample collection and processing and after any other activity that does not involve direct contact with the sample.

e. Sample Collection Methods for Pb in sediment

1. Complete the pre-labeled sample containers including field station codes, sample date, and time. Identify field and/or lab duplicate samples on the label, the COC, and on the field data sheet.
2. Fill out the field data sheet completely, including any unusual sample conditions and to document the sample time, GPS coordinates, and any pictures taken.
3. Use fresh/new gloves for each sampling location within each of the monitoring stations. Gloves should be kept clean during transport to the field. They should be fresh/new and only put on directly before opening the bottle for sampling. Take care not to place gloved fingers inside sampling container and avoid touching the opening.

4. Special care should always be used to avoid contamination of the inside of the sample container and cap. It is recommended to store bottles in resealable plastic bags before collecting samples to prevent contamination.
5. Before handling sample bottles or sampling equipment the designated diver/sampler shall wear two pairs of nitrile gloves, on top of each other on each hand. The diver/sample collector shall enter the water with bottles and a stainless-steel scoop or spatula in a resealable bag for one sample. After identifying the cable and sampling site the diver shall remove one pair of the gloves to minimize contamination between the time of entering the water and identifying the sampling location.
6. Use a stainless-steel scoop or spatula to collect surficial (<1") of sediment, taking care to minimize disturbance and loss of fine-grained or organic material, and place within a 4-oz amber glass bottle. Fill at least three (3) bottles from each monitoring station from sediment immediately below and adjacent (within 2" of lateral distance) to the cable segment. Carefully cap the sample below water as soon as possible and hand it directly to the member of the boat crew responsible for sample processing and storage.
7. Homogenize the sample in a stainless-steel bowl and stainless-steel spoon. Homogenized samples shall be placed in three (3) clean 4-ounce amber glass jars for analysis of lead and PAHs. The lab shall preserve an additional sample for potential SPLP and/or TCLP analysis.
8. Double-check the sample bottle caps are tightly sealed and place bottles into double resealable plastic bags and on ice in a cooler immediately after collection.
9. The diver performing the sampling and the boat crew responsible for filtration and sample handling must change gloves after each sample collection and processing and after any other activity that does not involve direct contact with the sample.
10. Refer to Section 3 of the QAPP and Appendix C for discussion of and reference to methods for the collection and preservation of algae and biota.

f. Sample Handling and Preservation

Samples should be cooled to ≤ 10°C as soon as possible after sampling. Replenish ice while traveling to the lab to ensure samples remain cool.

Contact the testing lab to confirm the arrival time. Deliver samples in a cooler by hand to California Laboratory Services in Rancho Cordova, CA. Have the laboratory sign the COC upon receipt. Make a copy of the chain of custody form for your own records.

g. Laboratory Communication and Analysis

Communicate with the laboratory at least 24 hours prior to the sampling event to ensure they can meet the hold time, confirm which hold time applies to your project, and provide an estimated time of arrival. Ensure the Chain of Custody is completed to the specifications of the laboratory and that samples arrive with enough time for the lab to process them within the appropriate holding time

4. FIELD DATA MEASUREMENTS

The process for collecting field measurement is based on methods developed by the California State Water Board.[12] Prior to visiting a site, field personnel may pre-fill core information about the planned sampling event into standardized field sheets and chain of custody forms. This information may include the project, station, and agency codes and information, along with the sample container types and number to be filled. Instrument calibration results should be recorded on the appropriate logs or field sheets at the time of instrument calibration. Once at a site, field measurement data and observations shall be recorded within the applicable field sheets as they are collected or recorded or downloaded to the equipment's data storage device per agency policy or the manufacturers' guidance. Samples are to be submitted to the appropriate laboratories under Chain-of-Custody within the required holding time and sampling handling conditions.

When field measurements are made with a multiparameter instrument, it is preferable to place the sonde in the body of water to be sampled and allow for equilibration. Allow the pH probe to equilibrate for at least one minute before pH is recorded to the nearest 0.1 pH unit. Allow the conductivity probe to equilibrate for at least one minute before specific conductance is recorded to three significant figures (if the value exceeds 100). The primary physical problem in using a specific conductance meter is entrapment of air in the conductivity probe chambers. The presence of air in the probe is indicated by unstable specific conductance values fluctuating up to +_/-100 µS/cm. The entrainment of air can be minimized by slowly, carefully placing the probe into the water; and when the probe is completely submerged, rotate it and quickly move it through the water to release any air bubbles.

The multi-parameter probe being used for this project is the YSI Pro1030. Water depths are expected to be less than 25 ft (7.6 m) and multi-probe measurements shall be taken from the boat at a depth and location close to the sampling location.

5. DEMOBILIZATION

Before leaving the sampling site, field personnel should perform the following tasks:

- Ensure a field observations and data is collected;
- Ensure all Chain of Custody forms and field data sheets are complete;
- Ensure that all containers are labeled, capped tightly, and stored in a cooler on bagged cubed ice; and
- Verify that all sampling-related materials and equipment have been collected.

6. CHAIN OF CUSTODY FORMS

[12] Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples with Associated Field Measurements and Physical Habitat in California. Version 1.1, March 2014 (MPSL Field SOP v.1.1).

Chain-of-custody (COC) procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal of analytical results. Forms shall be supplied by contract laboratories for use with each set of samples. COCs will be completed and supplied with samples for each laboratory. In the event coolers are shipped to a laboratory, form(s) will be completed and sent with the samples for each cooler, either placed in an envelope and taped to the inside of the top of the cooler or placed into a zip-top bag and placed within the cooler.

The COC will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped, the custody of the samples will be the responsibility of the field crew. The Project Manager or designee will sign the COC in the "relinquished by" box and note date and time and will ensure the recipient also signs the COC and adds the date and time.

7. SAMPLE SHIPMENT

Samples will be personally delivered to either California Laboratory Services in Rancho Cordova, CA, or another ELAP-certified laboratory of suitable standards, eliminating the need for shipping. If required to fulfill project objectives, as determined by the Project Manager, samples can be dispatched to alternative laboratories, following a chain of custody protocol and utilizing an overnight delivery service.

APPENDIX B: YSI PRO1030 MANUAL

Pro1030

USER MANUAL

English

YSI

a xylem brand

Item #605182
Rev A, January 2013
For the latest version of this manual,
visit ysi.com

CONTENTS

WARRANTY

The YSI Professional 1030 instrument (Pro1030) is warranted for three (3) years from date of purchase by the end user against defects in materials and workmanship, exclusive of batteries and any damage caused by defective batteries. Pro1030 cable assemblies are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. Pro1030 pH and ORP sensors are warranted for one (1) year from date of purchase by the end user against defects in material and workmanship. Pro1030 instruments, cables & sensors are warranted for one (1) year from date of purchase by the end user against defects in material and workmanship when purchased by rental agencies for rental purposes. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio at +1 937 767-7241, 800-897-4151 or visit www.YSI.com for a Product Return Form. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

LIMITATION OF WARRANTY

This Warranty does not apply to any YSI product damage or failure caused by:

1. Failure to install, operate or use the product in accordance with YSI's written instructions;
2. Abuse or misuse of the product;
3. Failure to maintain the product in accordance with YSI's written instructions or standard industry procedure;
4. Any improper repairs to the product;
5. Use by you of defective or improper components or parts in servicing or repairing the product;
6. Modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

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INTRODUCTION

Thank you for purchasing the YSI Pro1030, an instrument from the YSI *Professional Series* product family. The Pro1030 measures conductivity, temperature and either pH or ORP in water. The Pro1030 features an impact resistant and waterproof (IP-67) case, a rugged MS-8 (military-spec) cable connector, backlit display, user-selectable sensor options, 50 data set memory and a rubber over-mold case.

The Pro1030 provides valuable instructions and prompts near the bottom of the display that will guide you through operation and use; however, reading the entire manual is recommended for a better understanding of the instrument's features.

> *The Pro1030 cannot communicate to a PC via a ProComm communications saddle.*

GETTING STARTED

INITIAL INSPECTION

Carefully unpack the instrument and accessories and inspect for damage. Compare received parts with items on the packing list. If any parts or materials are damaged or missing, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or the authorized YSI distributor from whom the instrument was purchased.

BATTERY INSTALLATION

The instrument requires 2 alkaline C-cell batteries. Under normal conditions, the average battery life is 425 hours at room temperature without using the back light. A battery symbol will blink in the lower, left corner of the display to indicate low batteries when approximately 1 hour of battery life remains.

To install or replace the batteries:

1. Turn the instrument off and flip over to view the battery cover on the back.
2. Unscrew the four captive battery cover screws.
3. Remove the battery cover and remove the old batteries if necessary.

4. Install the new batteries, ensuring correct polarity alignment (figure 1).
5. Place the battery cover on the back of the instrument and tighten the four screws. Do not over-tighten.

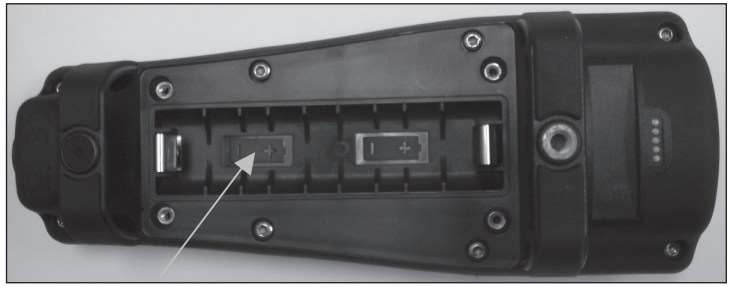

Figure 1. Pro1030 with battery cover removed. Notice battery symbols indicating polarities.

> ⓘ *The waterproof instrument case is sealed at the factory and is not to be opened, except by factory-authorized service technicians. Do not attempt to separate the two halves of the instrument case as this may damage the instrument, break the waterproof seal, and will void the warranty.*

KEY PAD

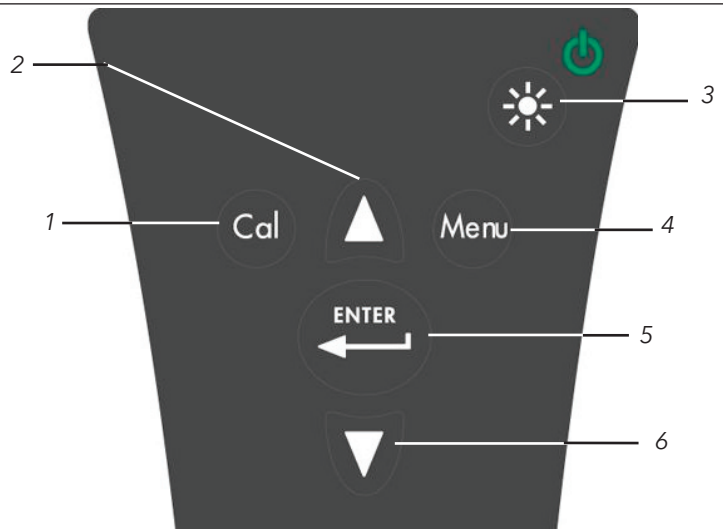

Figure 2, Keypad

Number	*Key*	*Description*
1	Cal	**Calibrate** Press and hold for 3 seconds to calibrate. Opens Calibrate menu from the Run screen.
2	▲	**Up Arrow** Use to navigate through menus, to navigate through box options along the bottom of the Run screen and to increase numerical inputs.
3	⏻ ☀	**Power and Backlight** Press once to turn instrument on. Press a second time to turn backlight on. Press a third time to turn backlight off. Press and hold for 3 seconds to turn instrument off.
4	Menu	**Menu** Press to enter the System Setup menu from the Run screen.
5	ENTER	**Enter** Press to confirm entries and selections.
6	▼	**Down Arrow** Use to navigate through menus, to navigate through box options at the bottom of the Run screen and to decrease numerical inputs.

CONNECTING THE SENSOR AND CABLE

"Bulkhead" refers to the single-pin connector at the end of the probe/cable assembly where an ISE sensor, either pH or ORP, is installed (figure 3). The conductivity and temperature sensors are located above and next to the bulkhead and are not replaceable.

When an ISE sensor is not installed in the cable, the bulkhead connector is not water-proof. Do not submerge the cable without a sensor installed. Submerging the cable without a sensor installed may cause permanent damage to the cable that is not covered under warranty.

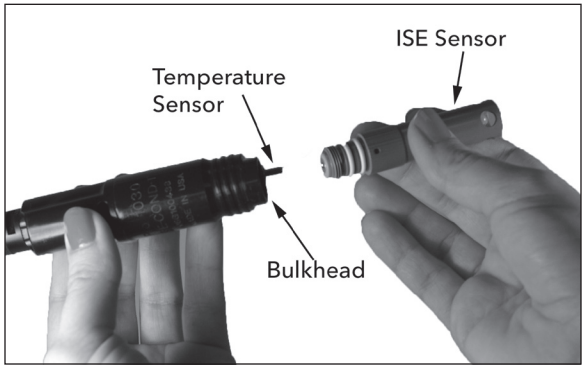

Figure 3

INSTALLING THE ISE SENSOR

The Pro1030 has three compatible ISE sensors: pH (model #1001), pH-amplified (model #1001A) and ORP (model #1002).

1. Remove the plastic plug from the cable's bulkhead port by pulling it straight out of the port. This can be discarded.
2. Remove the red plastic plug from the sensor's connector by pulling it straight off the sensor. This can be discarded.
3. Ensure both the sensor connector and bulkhead connector are clean and dry.
4. Grasp the sensor with one hand and the cable bulkhead in the other.
5. Push the sensor into the connector on the cable until it is firmly seated with only 1 o-ring visible. Failure to properly seat the sensor may result in damage.
6. Twist the sensor clockwise to engage the threads and finger tighten. Do NOT use a tool. This connection is water-tight.

The ISE sensor is shipped with the tip in a storage bottle. To remove, twist the bottle off the lid and remove the bottle from the sensor. Next, remove the o-ring and slide the lid off the sensor.

CONNECTING THE PROBE/CABLE ASSEMBLY TO THE INSTRUMENT

To connect the cable, align the keys on the cable connector to the slots on the instrument connector. Push together firmly and then twist the outer ring until it locks into place (figure 4). This connection is water-proof.

Figure 4, Note the keyed connector.

RUN SCREEN

Press the power/backlight key to turn the instrument on. The instrument will run through a self test and briefly display a splash screen with system information before displaying the main Run screen (figure 5). A language selection menu will display the first time the Pro1030 is powered on. See the First Power On section of this manual for more information.

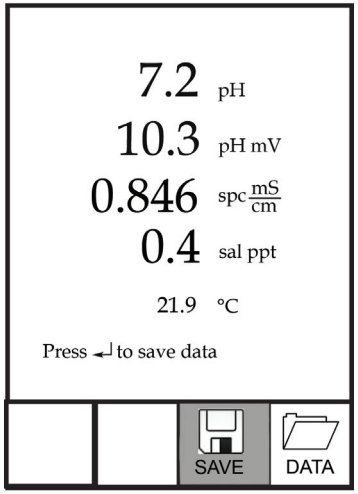

Figure 5, Run screen.

BACKLIGHT

Once the instrument is powered on, pressing the power/backlight key will turn on the display backlight. The backlight will remain on until the key is pressed again or after two minutes of not pressing any key on the keypad.

POWERING OFF

To turn the instrument off, press and hold the power/backlight key for three seconds.

NAVIGATION

The up and down arrow keys allow you to navigate through the functions of the Pro1030.

NAVIGATING THE RUN SCREEN

When in the Run screen, the up and down arrow keys will move the highlighted box along the bottom options. Once a box is highlighted, press enter to access the highlighted option.

Description of Run screen box functions from left to right:

Option	*Description*
SAVE	Highlight and press enter to save displayed data to memory.
DATA	Highlight and press enter to view and/or erase saved data.

NAVIGATING THE SYSTEM SETUP MENU

When in the System Setup menu, the up and down arrow keys will move the highlighted bar up and down the system setup options. See the System Setup menu section of this manual for more information about these options.

FIRST POWER ON

The instrument will step through an initial configuration when powered on for the first time. This will set the language. Use the up or down arrow keys to highlight the appropriate language, then press enter to confirm (figure 6).

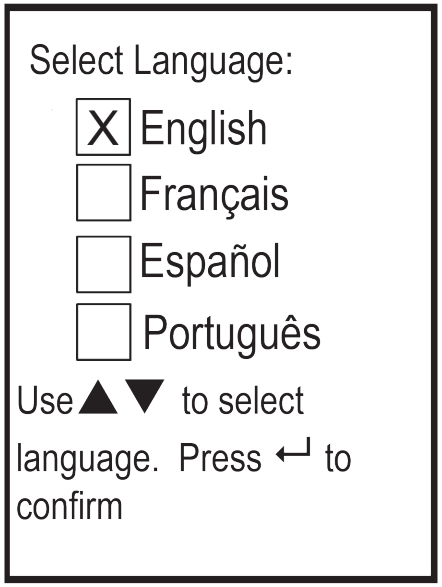

Figure 6, Select language

After selecting a language, the Run screen will be displayed. The next time the instrument is powered up, the Run screen will display immediately after the splash screen.

SYSTEM SETUP MENU

Press the menu key to access the System Setup menu. The System Setup menu contains two screens notated as 'pages'. The current page is indicated near the bottom of the display (figure 7).

Use the up and down arrow keys to scroll through menu options and menu pages.

EXITING THE SYSTEM SETUP MENU

To exit the System Setup menu, press the down arrow key until the ESC - Exit box is highlighted, then press enter to return to the Run screen.

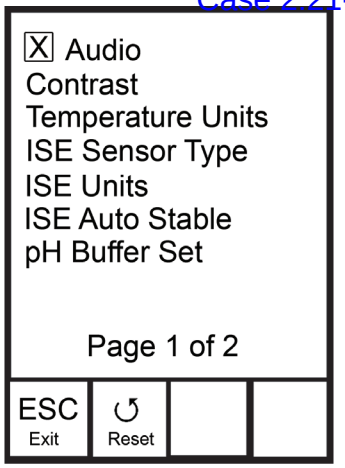

Figure 7, page 1 of System Setup menu.

AUDIO

Audio can be enabled by highlighting Audio and pressing enter. When enabled, there will be an 'X' in the box next to Audio.

When Audio is enabled, the Pro1030 will beep twice to indicate stability when Auto Stable is enabled. The instrument will also beep when a key is pressed. When Audio is disabled, the Pro1030 will not beep.

CONTRAST

To adjust the display Contrast, use the up or down arrow keys to highlight Contrast, then press enter. Next, use the up or down arrow keys to adjust the contrast. The up arrow key will darken the contrast and the down arrow key will lighten the contrast. After adjusting the contrast, press enter to save and exit the Contrast adjustment function.

ALTERNATE CONTRAST ADJUSTMENT OPTION

If necessary, there is an alternate method of adjusting the contrast. To adjust the contrast, press and hold the menu key, then press the up arrow key to darken the contrast or press the down arrow key to lighten the contrast.

TEMPERATURE UNITS

Highlight Temperature Units and press enter to open a submenu that allows you to change the temperature units displayed on the Run screen. Highlight the desired unit (Celsius or Fahrenheit) and press enter to enable. The enabled temperature unit will have an 'X' in the box next to it. Only one unit may be enabled at a time. Highlight the ESC-Exit box and press enter to save any changes and to close the Temperature Units submenu.

ISE SENSOR TYPE

ISE Sensor Type sets the type of ISE sensor being used; either pH (model #1001) or ORP (model #1002).

Use the up or down arrow keys to highlight ISE Sensor Type, then press enter to open a submenu. Highlight the sensor type corresponding to the sensor installed on the cable and press enter to confirm. The enabled sensor type will have an 'X' in the box next to it. Next, use the down arrow key to highlight the ESC – Exit, then press enter to save changes and to close the sensor submenu.

ISE UNITS

Highlight ISE Units and press enter to open a submenu that allows you to select the ISE units to be displayed on the Run screen. Highlight a unit and press enter to enable or disable it. An enabled ISE unit will have an 'X' in the box next to it. Highlight the ESC-Exit box along the bottom of the display and press enter to save any changes and to close the ISE Units submenu.

When pH is enabled in the ISE Sensor Type menu, there are two selectable measurement units: pH and pH mV. pH mV is the sensor's electrical measurement signal before being converting into pH units. pH mVs can help you determine if you are performing a good calibration and the condition of the pH electrode.

When ORP is enabled in the ISE Sensor Type menu, only ORP mVs can be enabled as the ISE unit.

AUTO STABLE

Auto Stable utilizes preset values to indicate when a reading is stable. The preset values are adjustable in the System Setup menu. The user can input a % change in measurement reading over 'x' amount of time in seconds. There are two separate Auto Stable controls, one for ISE readings (ISE Auto Stable) and one for conductivity readings (Cond. Auto Stable). ISE Auto Stable is located on the first page of the System Setup menu. Cond. Auto Stable is located on the second page of the System Setup menu.

When Auto Stable is enabled, an (AS) symbol will display next to the reading on the Run screen and blink during stabilization. When the ISE and/or conductivity reading stabilizes based on the Auto Stable settings, the (AS) symbol will display steadily and the instrument will beep twice if Audio is turned on.

ISE Auto Stable can be set to a % change of 0.0 to 9.9% over 3 to 19 seconds. The auto stable criteria is be applied to the pH measurement or the ORP mV reading depending on which sensor is enabled in the ISE Sensor menu.

Conductivity Auto Stable can be set to a % change of 0.0 to 1.9% over 3 to 19 seconds. The conductivity auto stable criteria is applied to the conductivity reading, but the AS symbol will display next to all enabled conductivity units.

To enable Auto Stable, highlight either ISE Auto Stable or Cond. Auto Stable, then press enter to open the submenu. Next, use the up or down arrow keys to highlight the % change or seconds (secs) input field, then press enter to make the highlighted field adjustable. Use the up or down arrow keys to adjust the selected value, then press enter to confirm changes. Once you have confirmed any changes, highlight the ESC-Exit box along the bottom of the display and press enter to close the Auto Stable submenu. To disable Auto Stable, set the % Change input to 0.0.

pH BUFFER SET

Highlight pH Buffer Set and press enter to open a submenu that allows you to select the Buffer Set used for auto buffer recognition during a pH calibration. There are two buffer set options: USA (4, 7 and 10) and NIST (4.01, 6.86 and 9.18). Highlight the buffer set and press enter to enable. The enabled buffer set will have an 'X' in the box next to it. Highlight the ESC-Exit box and press enter to save any changes and to close the submenu.

CONDUCTIVITY UNITS (COND. UNITS)

Highlight Cond. Units (Conductivity Units) and press enter to open a submenu that allows you to select the conductivity units to be displayed on the Run screen. Highlight a unit and press enter to enable or disable it. An enabled conductivity unit will have an 'X' in the box next to it. Highlight the ESC-Exit box along the bottom of the display and press enter to save any changes and to close the conductivity units submenu.

There are seven options for displaying conductivity. Only two units can be enabled at the same time:

- COND-mS/cm displays conductivity in milliSiemens per centimeter.
- COND-uS/cm displays conductivity in microSiemens per centimeter.
- SPC-mS/cm displays Specific Conductance in milliSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- SPC-uS/cm displays Specific Conductance in microSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- Sal ppt displays salinity in parts per thousand. The salinity reading is calculated from the instrument's conductivity and temperature values using algorithms found in *Standard Methods for the Examination of Water and Wastewater*.
- TDS g/L displays Total Dissolved Solids in grams per liter. TDS is calculated from conductivity compensated to 25°C using a user-selectable TDS constant.
- TDS mg/L displays Total Dissolved Solids in milligrams per liter. TDS is calculated from conductivity compensated to 25°C using a user-selectable TDS constant.

Note: 1 S = 1 mho.
1 milliSiemen = 1,000 microSiemens.

SPECIFIC CONDUCTANCE

The conductivity of a sample is highly dependent on temperature, varying as much as 3% for each change of one degree Celsius (temperature coefficient = 3%/°C). In addition, the temperature coefficient itself varies with the nature of the ionic species present in the sample. Therefore, it is useful to compensate for this temperature dependence in order to quickly compare conductivity readings taken at different temperatures.

The Pro1030 can display non-temperature compensated conductivity as well as temperature compensated Specific Conductance. If Specific Conductance is enabled, the Pro1030 uses the temperature and conductivity values associated with each measurement to calculate a specific conductance value that is temperature compensated based on a user-selected temperature coefficient (0 to 4%) and reference temperature (15 to 25°C).

Using the Pro1030's default reference temperature and temperature coefficient (25 °C and 1.91%), the calculation is carried out as follows:

$$\text{Specific Conductance (25°C)} = \frac{\text{Conductivity of sample}}{1 + 0.0191 * (T - 25)}$$

T = Temperature of the sample in °C

SPECIFIC CONDUCTANCE REFERENCE TEMPERATURE (SPC REF. TEMP.)

SPC Ref. Temp. (Specific Conductance Reference Temperature) is the reference temperature used to calculate Specific Conductance. The reference temperature range is 15 and 25°C. The default value is 25°C.

To change the reference temperature, highlight SPC Ref. Temp. and press enter to open the submenu. With the reference temperature highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new reference temperature. Next, highlight the ESC-Exit box and press enter to close the submenu.

SPECIFIC CONDUCTANCE TEMPERATURE COEFFICIENT (SPC %/°C)

SPC %/°C (Specific Conductance Temperature Coefficient) is the temperature coefficient used to calculate Specific Conductance. The coefficient range is 0.00 to 4.00. The default value is 1.91% which is based on KCl standards.

To change the temperature coefficient, highlight SPC %/°C and press enter to open the submenu. With the temperature coefficient highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new coefficient. Next, highlight the ESC-Exit box and press enter to close the submenu.

TDS CONSTANT

TDS Constant is a multiplier used to calculate an estimated TDS (Total Dissolved Solids) value from conductivity. The multiplier is used to convert Specific Conductance in mS/cm to TDS in g/L. The Pro1030's default value is 0.65. This multiplier is highly dependent on the nature of the ionic species present in the water sample. To be assured of moderate accuracy for the conversion, you must determine a multiplier for the water at your sampling site. Use the following procedure to determine the multiplier for a specific sample:

1. Determine the specific conductance of a water sample from the site;
2. Filter a sample of water from the site;
3. Completely evaporate the water from a carefully measured volume of the filtered sample to yield a dry solid;
4. Accurately weigh the remaining solid;
5. Divide the weight of the solid (in grams) by the volume of water used (in liters) to yield the TDS value in g/L for this site;
6. Divide the TDS value in g/L by the specific conductance of the water in mS/cm to yield the conversion multiplier. Be certain to use the correct units.

If the nature of the ionic species at the site changes between sampling studies, the TDS values will be in error. TDS cannot be calculated accurately from specific conductance unless the make-up of the chemical species in the water remains constant.

To change the TDS Constant in the Pro1030, highlight TDS Constant and press enter to open the submenu. With the TDS Constant highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. The input range is 0.30 to 1.00. Press enter to save the new TDS Constant. Next, highlight the ESC-Exit box and press enter to close the submenu.

LANGUAGE

Highlight Language and press enter to open a submenu that allows you to change the language. Highlight the desired language (English, Spanish, Portuguese, or French) and press enter to enable. The enabled language will have an 'X' in the box next to it. Highlight ESC-Exit box and press enter to save any changes and to close the Language submenu.

The text in the boxes along the bottom of the Run screen will always be displayed in English regardless of the language enabled in the System Setup menu.

AUTO SHUTOFF

Auto Shutoff allows you to set the instrument to turn off automatically after a period of time. In the setup menu, use the up or down arrow keys to highlight Auto Shutoff, then press enter to open the submenu. Press enter while the minute field is highlighted to make it adjustable.

Next, use the up or down arrow keys to adjust the shut off time from 0 to 60 minutes. Press enter to save the new shutoff time. Next, highlight the ESC-Exit box and press enter to close the submenu.

To disable Auto Shutoff, set the Time in Minutes to 0 (zero).

CELL CONSTANT

The Cell Constant displays the cell constant of the conductivity cell. The cell constant is calculated and updated each time a conductivity calibration is performed. The cell constant range is 4.0 to 6.0. Resetting the System Menu resets the cell constant to 5.0.

RESETTING THE SYSTEM SETUP MENU AND CELL CONSTANT TO FACTORY DEFAULT

To reset the Pro1030 settings and conductivity cell constant back to factory default, press the down arrow key while in the System Setup menu until the Reset - ↺ box is highlighted, then press enter. The instrument will prompt you to confirm the reset. Highlight Yes and press enter to continue with the reset or highlight No and press enter to cancel the reset. A Factory Reset will not affect data saved in the instrument's memory.

The following will be set in the Pro1030 after performing a reset:

Parameter	*Reset Defaults*
Audio	On
Contrast	Set to mid range
Temperature Units	°C
ISE Sensor Type	pH
ISE Units	pH
ISE Auto Stable	Off (0.0 % Change and 10 seconds)
pH Buffer Set	USA
Conductivity Units	*cond mS/cm and spc mS/cm*
Conductivity Auto Stable	Off (0.0 % Change and 10 seconds)
SPC Reference Temperature	*25°C*
SPC Temperature Coefficient	*1.91%/°C*
TDS Constant	*0.65*
Language	English
Auto Shutoff	30 minutes
Conductivity Cell Constant	5.0
pH Calibration	Factory default

CALIBRATION

TEMPERATURE

All Pro1030 cables have built-in temperature sensors. Temperature calibration is not required nor is it available.

pH CALIBRATION

The Pro1030 pH sensor can be calibrated by performing a 1, 2 or 3-point calibration. At least one of the calibration points must be done with pH buffer 7 or 6.86. For auto buffer recognition to work properly with an older or dirty sensor, calibrate in buffer 7 or 6.86 first. For highest accuracy, use fresh, traceable pH buffers and ensure the sensor and calibration vessel are clean.

1-POINT CALIBRATION

1. Place the sensor in pH buffer 7 or 6.86 and allow the temperature and pH readings to stabilize.
2. Press and hold Cal (Cal) for three seconds.
3. Highlight pH and press enter. If pH is not listed as an option, check the System Setup menu to ensure pH is enabled in the ISE Sensor Type menu.
4. Highlight 1 point and press enter.
5. If necessary, use the up and down arrow keys to adjust the pH buffer value. Note the pH mV reading which ideally should be between -50 and +50 in buffer 7.
6. Press enter to complete the calibration or press Cal (Cal) to cancel.

7. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
8. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

2-POINT CALIBRATION

1. Place the sensor in pH buffer 7 or 6.86 and allow the temperature and pH readings to stabilize.
2. Press and hold Cal for three seconds.
3. Highlight pH and press enter. If pH is not listed as an option, check the System Setup menu to ensure pH is enabled in the ISE Sensor Type menu.
4. Highlight 2 point and press enter.
5. If necessary, use the up and down arrow keys to adjust the pH buffer value. Note the pH mV reading which ideally should be between -50 and +50 in buffer 7.
6. Press enter to continue to second point.
7. Rinse the sensor and place it in the second pH buffer (4/4.01 or 10/9.18).
8. If necessary, use the up and down arrow keys to adjust the pH buffer value.
9. Wait approximately 30 to 60 seconds for the pH sensor to stabilize and for the temperature reading to stabilize. Note the pH mV reading. pH mVs in buffer 4 should be +159 to 180 mV from the previous buffer 7 pH mV value. pH mVs in buffer 10 should be -159 to 180 mV from the previous buffer 7 pH mV value.
10. Press enter to complete the calibration or press Cal to cancel.
11. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
12. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

3-POINT CALIBRATION

1. Place the sensor in pH buffer 7 or 6.86 and allow the temperature and pH readings to stabilize.
2. Press and hold Cal for three seconds.

3. Highlight pH and press enter. If pH is not listed as an option, check the System Setup menu to ensure pH is enabled in the ISE Sensor Type menu.
4. Highlight 3 point and press enter.
5. If necessary, use the up and down arrow keys to adjust the pH buffer value. Note the pH mV reading which should be between -50 and +50 in buffer 7.
6. Press enter to continue to second point.
7. Rinse the sensor and place it in the second pH buffer (4/4.01 or 10/9.18). If necessary, use the up and down arrow keys to adjust the pH buffer value.
8. Wait approximately 30 to 60 seconds for the pH sensor to stabilize and for the temperature reading to stabilize. Note the pH mV reading. pH mVs in buffer 4 should be +159 to 180 mV from the previous buffer 7 pH mV value. pH mVs in buffer 10 should be -159 to 180 mV from the previous buffer 7 pH mV value.
9. Rinse the sensor and place it in the third pH buffer (4/4.01 or 10/9.18). If necessary, use the up and down arrow keys to adjust the pH buffer value.
10. Wait approximately 30 to 60 seconds for the pH sensor to stabilize and for the temperature reading to stabilize. Note the pH mV reading. pH mVs in buffer 4 should be +159 to 180 mV from the previous buffer 7 pH mV value. pH mVs in buffer 10 should be -159 to 180 mV from the previous buffer 7 pH mV value.
11. Press enter to complete the calibration or press Cal to cancel.
12. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
13. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

ORP CALIBRATION

1. Place the clean sensor in ORP calibration solution. Wait for the ORP and temperature readings to stabilize.
2. Press and hold Cal for three seconds.
3. Highlight ORP and press enter. If ORP is not listed as an option, check the System Setup menu to ensure ORP is enabled in the ISE Sensor Type menu.
4. Use the up and down arrow keys to adjust the ORP calibration solution value.

5. Wait for the temperature reading to stabilize, then press enter to complete the calibration or press Cal (Cal) to cancel.
6. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
7. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

CONDUCTIVITY CALIBRATION

Ensure the conductivity sensor is clean and dry before performing a conductivity, specific conductance or salinity calibration.

It is not necessary to calibrate conductivity, specific conductance and salinity. Calibrating one of these parameters will simultaneously calibrate the others. YSI recommends calibrating specific conductance for greatest ease.

Always calibrate with fresh, traceable calibration solution with a value of 1000 uS or more.

Note: 1 mS = 1000 uS

CALIBRATING SPECIFIC CONDUCTANCE (SPC) OR CONDUCTIVITY

Note: When calibrating Specific Conductance, the Pro1030 uses the factory default values for the Specific Conductance Reference Temperature and the Specific Conductance Temperature Coefficient regardless of what is configured in the System Setup Menu. The default value for the Reference Temperature is 25°C and the default value for the Temperature Coefficient is 1.91%/°C. It is important to note that the Temperature Coefficient of a calibration solution is dependent on the contents of the solution. Therefore, for highest accuracy, YSI recommends using a traceable calibration solution made of KCl (potassium chloride) when calibrating Specific Conductance since these solutions typically have a Temperature Coefficient of 1.91%/°C. Additionally, be sure to enter the value of the solution as it is listed for 25°C when calibrating Specific Conductance.

1. Place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 8). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.

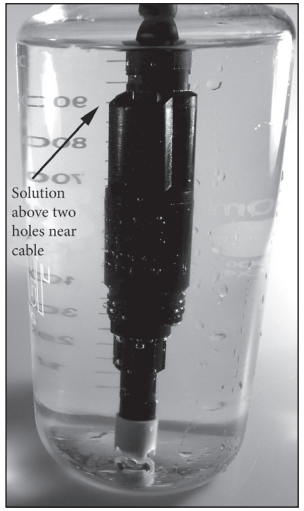

Figure 8, solution above two holes near cable.

2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight the desired calibration method, Sp. Conductance or Conductivity, and press enter.
3. Highlight the units you wish to calibrate, either uS/cm or mS/cm, and press enter. 1 mS = 1,000 uS.
4. Use the up or down arrow key to adjust the value on the display to match the value of the conductivity calibration solution. Most conductivity solutions are labeled with a value at 25°C. If calibrating specific conductance, enter the value listed for 25°C. If calibrating conductivity, look up the value of the solution at the solution's current temperature and enter that value into the Pro1030. Press and holding either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro1030 will remember the entered calibration value and display it the next time a conductivity calibration is performed.
5. Press enter to complete the calibration or press Cal to cancel.
6. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.

7. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

CALIBRATING IN SALINITY

1. Place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 8). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.
2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight Salinity and press enter.
3. Use the up or down arrow key to adjust the value on the display to match the value of the salinity solution. Press and holding either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro1030 will remember the entered calibration value and display it the next time a salinity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

TAKING MEASUREMENTS

Before taking measurements, be sure the instrument has been calibrated to ensure the most accurate readings. Install the sensor guard to protect the pH or ORP sensor. Place the probe in the sample to be measured and give the probe a quick shake to release any air bubbles.

CONDUCTIVITY

The conductivity sensor will provide quick readings as long as the entire sensor is submerged and no air bubbles are trapped in the sensor area. Immerse the probe into the sample so the sensors are completely submerged and then shake the probe to release any air bubbles. Occasional cleaning of the sensor may be necessary to maintain accuracy and increase the responsiveness. To clean the sensor, use the soft bristle cleaning brush provided with the instrument and a mild detergent.

pH/ORP

pH and ORP readings are typically quick and accurate. However, it may take the sensors a little longer to stabilize if they become coated or fouled. To improve the response time of a sensor, follow the cleaning steps in the Maintenance section of this manual.

SAVING AND VIEWING DATA

The Pro1030 can store 50 data sets in non-volatile memory for later viewing. A data set includes the values currently on the display, i.e. temperature, dissolved oxygen and two conductivity parameters. Each data point is referenced with a data set number, 01 through 50.

SAVING DATA

From the Run screen, use the up or down arrow keys to highlight the Save box and press enter to save the current readings. The instrument will indicate the data set is saved and display the saved data set's number (figure 9).

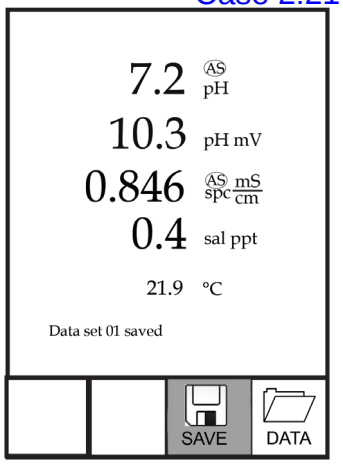

Figure 9, data set saved.

The instrument will display 'Memory Full' if all 50 data sets have been saved and you attempt to save another data set.

VIEWING AND ERASING SAVED DATA

Data mode allows you to view and erase saved data. From the Run screen, use the up or down arrow keys to highlight Data and press enter to access Data mode. Note that the function boxes at the bottom of the display are different in Data mode (figure 10).

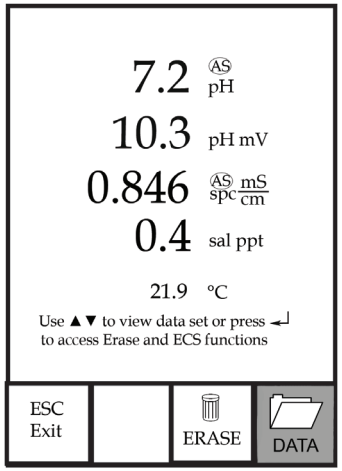

Figure 10, Data mode.

VIEWING DATA

Once in Data mode, use the up and down arrow keys to view saved data sets in sequential order or press enter to access the bottom functions. After accessing the bottom functions, highlight the Data box and press enter to regain access to viewing data. The data set displayed is indicated by the data set number, 01 through 50.

ERASING DATA

While viewing saved data, press the enter key to access the function boxes at the bottom of the display. Next, use the up or down arrow keys to highlight Erase, then press enter. The instrument will give you the option to erase one data set or all data sets (figure 11).

Figure 11, Erase data mode.

Use the up or down arrow key to select Erase Data Set, Erase All Sets or the ESC-Exit function box, then press enter to confirm.

Select ESC-Exit and press enter to exit Erase mode without erasing any data.

Select Erase Data Set and press enter to erase the data set that was displayed before entering Erase mode. For example, if data set 12 was displayed before entering erase mode, and Erase Data Set is selected, Data Set 12 will be erased from memory and the data sets AFTER that number will move up to keep them sequential. For example, if there are 15 records and number 12 is erased then 13 becomes 12, 14 becomes

13, and 15 becomes 14. The instrument will return to Data mode after erasing one data set.

Select Erase All Data Sets and press enter to clear the Pro1030 memory and return to Data mode.

EXITING DATA MODE

While in Data mode, press enter to access the bottom functions. Next, highlight the ESC-Exit box and press enter to return to the Run screen.

CARE, MAINTENANCE AND STORAGE

This section describes the proper procedures for care, maintenance and storage of the sensors. The goal is to maximize their lifetime and minimize down-time associated with improper sensor usage.

GENERAL MAINTENANCE

GENERAL MAINTENANCE - GASKET AND O-RINGS

The instrument utilizes a gasket and o-rings as seals to prevent water from entering the battery compartment and the sensor port. Following the recommended procedures will help keep the instrument functioning properly.

If the gasket, o-rings and sealing surfaces are not maintained properly, it is possible that water can enter the battery compartment and/or sensor port of the instrument. If water enters these areas, it can damage the battery terminals or sensor port causing loss of battery power, false readings and corrosion to the sensors or battery terminals. Therefore, when the battery compartment lid is removed, the gasket that provides the seal should be carefully inspected for contamination (i.e. debris, grit, etc.) and cleaned with water and mild detergent if necessary.

The same inspection should be made of the o-rings associated with the ISE sensor connector when replacing the ISE sensor. The o-rings should be free of dirt or debris before installing the sensor onto the cable.

GENERAL MAINTENANCE - ISE SENSOR PORT

It is important that the entire sensor connector end be dry when installing, removing or replacing the sensor. This will prevent water

from entering the port. Once the ISE sensor is removed, examine the connector inside the port. If any moisture is present, use compressed air to completely dry the connector or let it air dry. If the connector is corroded, contact YSI Technical Support or the YSI authorized dealer where you purchased the instrument.

SENSOR MAINTENANCE

> ⓘ *Typical working life for pH and ORP sensors is approximately 12-24 months depending on usage, storage and maintenance. Proper storage and maintenance generally extends the sensor's working life.*

SENSOR MAINTENANCE - TEMPERATURE

You must keep the temperature sensor free of build up. No additional maintenance is required. A toothbrush can be used to scrub the temperature sensor if needed.

SENSOR MAINTENANCE - CONDUCTIVITY

The openings that allow sample access to the conductivity electrodes should be cleaned regularly. The small cleaning brush included in the Maintenance Kit is intended for this purpose. Dip the brush in clean water and insert it into each hole 10 to 12 times. In the event that deposits have formed on the electrodes, it may be necessary to use a mild detergent (laboratory grade soap or bathroom foaming tile cleaner) with the brush. Rinse thoroughly with clean water, then check the response and accuracy of the conductivity cell with a calibration solution.

SENSOR MAINTENANCE - pH AND ORP

Cleaning is required whenever deposits or contaminants appear on the glass and/or platinum sensor surfaces or when the sensor's response slows. The cleaning can be chemical and/or mechanical.

Removing the sensor from the cable may make cleaning easier. Initially, use clean water and a soft clean cloth, lens cleaning tissue, or cotton swab to remove all foreign material from the glass bulb and/or platinum button. Then use a moistened cotton swab to carefully remove any material that may be blocking the reference electrode junction of the sensor.
If good pH and/or ORP response is not restored, perform the following additional procedure:

1. Soak the sensor for 10-15 minutes in clean water containing a few drops of commercial dish washing liquid.
2. GENTLY clean the glass bulb and platinum button by rubbing with a cotton swab soaked in the cleaning solution.
3. Rinse the sensor in clean water, wipe with a cotton swab saturated with clean water, and then rerinse with clean water.

If good pH and/or ORP response is still not restored, perform the following additional procedure:

1. Soak the sensor for 30-60 minutes in one molar (1 M) hydrochloric acid (HCl). This reagent can be purchased from most lab supply distributors. Be sure to follow the safety instructions included with the acid.
2. Rinse the sensor in clean water, wipe with a cotton swab saturated with clean water (not DI water), and then rerinse with clean water. To be certain that all traces of the acid are removed from the sensor crevices, soak the sensor in clean water for about an hour with occasional stirring.

If biological contamination of the reference junction is suspected or if good response is not restored by the above procedures, perform the following additional cleaning step:

1. Soak the sensor for approximately 1 hour in a 1:1 dilution of commercially-available chlorine bleach.
2. Rinse the sensor with clean water and then soak for at least 1 hour in clean water with occasional stirring to remove residual bleach from the junction. (If possible, soak the sensor for a period of time longer than 1 hour in order to be certain that all traces of chlorine bleach are removed.) Then rerinse the sensor with clean water and retest.

ⓘ **CAUTION**: *When using a cotton swab, be careful NOT to wedge the swab between the guard and the glass sensor. If necessary, remove cotton from the swab tip, so that the cotton can reach all parts of the sensor tip without stress. You can also use a pipe cleaner for this operation if more convenient.*

ⓘ *Dry the port and sensor connector with compressed air and apply a very thin coat of o-ring lubricant to all o-rings before reinstallation.*

If this procedure is unsuccessful, as indicated by improper sensor performance, contact YSI Technical Support or the YSI authorized dealer where you purchased the instrument.

SENSOR STORAGE

SHORT TERM STORAGE

The instrument is supplied with a grey storage sleeve that slides over the probe guard. The sleeve is used for short-term storage (less than 2 weeks). Be sure to keep a small amount of moisture (clean tap water) on the sponge in the sleeve during storage. The moistened sponge in the sleeve provides a 100% water saturated air environment which is ideal for short-term sensor storage.

LONG TERM STORAGE

The conductivity sensor should be stored long term in a dry state while the ISE sensor should be stored in solution. When storing for more then 30 days, place the ISE sensor in the storage bottle that was originally included with the sensor. This can be filled with buffer 4 solution. If you no longer have the storage bottle, simply place the sensor in a buffer 4 solution. Ensure the conductivity sensor is clean and dry.

Long Term Storage Temperature: -5 to 70°C (23 to 158°F) without pH
0 to 30°C (32 to 86°F) with pH*

*Operating temperature range for pH sensor is -5 to 60°C (23 to 140°C).

TROUBLESHOOTING

Symptom	*Possible Solution*
Instrument will not turn on, a battery symbol appears, or "Critical Shutdown" displays on the screen.	1. Low battery voltage, replace batteries. 2. Batteries installed incorrectly, check battery polarity. 3. Return system for service.
Temperature values display Over or Undr on Run screen.	1. Sample temperature is less than -5° C or more than +55°C. Increase or decrease the sample temperature to bring within the allowable range. 2. Contact YSI Tech Support.

Symptom	*Possible Solution*
Instrument will not calibrate pH or ORP; instrument displays "Calibration Over", "Calibration Under", or "Unstable Reading" during calibration.	1. Verify correct sensor type selection in the System Setup menu. 2. Verify the calibration solution is accurate. 3. If calibrating pH, make sure you are calibrating buffer 7 first. 4. Clean the pH or ORP sensor. 5. Contact YSI Tech Support.
pH or ORP readings are inaccurate.	1. Verify correct sensor type selection in the System Setup menu. 2. Verify temperature readings are accurate. 3. Recalibrate the pH or ORP sensor. 4. Clean the pH or ORP sensor. 5. Contact YSI Tech Support.
pH values display Over or Undr on Run screen.	1. Verify correct sensor type selection in the System Setup menu. 2. Sample pH value is outside the measurement range of 0 to 14. 3. Verify temperature readings are accurate. 4. Recalibrate the pH sensor. 5. Clean the pH sensor and recalibrate. 6. Contact YSI Tech Support.
ORP values display Over or Undr on Run screen.	1. Verify correct sensor type selection in the System Setup menu. 2. Sample ORP value is outside the measurement range of -1500 to 1500 mV. 3. Verify temperature readings are accurate. 4. Recalibrate the ORP sensor. 5. Clean the ORP sensor and recalibrate. 6. Contact YSI Tech Support.

Symptom	*Possible Solution*
Instrument will not calibrate the Conductivity sensor; instrument displays "Calibration Over", "Calibration Under", or "Unstable Reading" during calibration.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the calibration solution is above the two holes near the cable, see figure 8. 3. Verify the calibration solution is not expired or contaminated. Try a new bottle of solution. 4. Ensure you are entering in the correct value for the solution according to the measurement units. 1 mS = 1,000 uS. 5. Allow sufficient stabilization time for conductivity and temperature AND wait at least 3 seconds before confirming a calibration. 6. Contact YSI Tech Support.
Conductivity readings are inaccurate.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8. 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Verify the correct units are setup in the System Setup menu, i.e. uS vs mS and Conductivity vs. Specific Conductance. 6. Contact YSI Tech Support.
Conductivity values display Over or Undr on Run screen.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Sample conductivity is outside the measurement range of the instrument, i.e. 0-200 mS. 6. Contact YSI Tech Support.

SPECIFICATIONS

These specifications represent typical performance and are subject to change without notice. For the latest product specification information, please visit YSI's website at ysi.com or contact YSI Tech Support.

Parameter	*Range*	*Resolution*	*Accuracy*
Temperature	-5 to 55°C	0.1°C	± 0.2°C
pH	0 to 14 pH units	0.01	Instrument with cable and sensor: +/- 0.2
ORP	-1500 to 1500 mV	1 mV	Instrument with cable and sensor: +/-20 mV
Conductivity	0-500 uS/cm 0-5 mS/cm 0-50 mS/cm 0-200 mS/cm (auto ranging)	0.0001 to 0.1 mS/cm; 0.1 to 0 uS/cm (range dependent)	Instrument only: ± 0.5% of the reading or 1 uS/cm, whichever is greater. Instrument with 1 or 4 meter cables: ± 1.0% of the reading or 1 uS/cm, whichever is greater. Instrument with 10, 20, or 30 meter cables: ± 2.0% of the reading or 1 uS/cm, whichever is greater.
Salinity	0 to 70 ppt	0.1 ppt	± 1.0% of the reading or ± 0.1 ppt, whichever is greater.
Total Dissolved Solids (TDS)	0 to 100 g/L. TDS Constant range: 0.3 to 1.00 (0.65 default)	0.0001 to 0.1 g/L (range dependent)	Dependent on accuracy of temperature, conductivity and TDS Constant.

ACCESSORIES / PART NUMBERS

Part Number	*Description*
6051030	Pro1030 Instrument
6261030-1, -4, -10, -20, or -30	1, 4, 10, 20, 30-meter cable assembly* (3.2, 13, 32.8, 65.6, 98.4-feet)
605101	pH Sensor
605102	ORP Sensor
603077	Flow cell
603056	Flow cell mounting spike
603075	Carrying case, soft-sided
603074	Carrying case, hard-sided
603069	Belt clip for clipping instrument onto belt
063517	Ultra clamp for instrument for clamping instrument to lab counter or other surface
063507	Tripod for instrument
603062	Cable management kit, included with all cables longer than 1 meter
605978	Cable weight, 4.9 oz, stackable
603070	Shoulder strap
038213	Soft bristle brush for cleaning conductivity cell
003821	pH 4 Buffer, box of 6 pints
003822	pH 7 Buffer, box of 6 pints
003823	pH 10 Buffer, box of 6 pints
603824	pH Buffer, assorted case, 2 pints each of buffer 4, 7 and 10
060907	Conductivity Calibration Solution, 1,000 µS/cm. 1 box of 8 pints.
060911	Conductivity Calibration Solution, 10,000 µS/cm. 1 box of 8 pints.
060660	Conductivity Calibration Solution, 50,000 µS/cm. 1 box of 8 pints.
065274	Conductivity Calibration Solution, 100,000 µS/cm. 1 box of 8 pints.

*All cables include a temperature and conductivity sensor. The pH or ORP sensor is sold separately.

DECLARATION OF CONFORMITY

The undersigned hereby declares on behalf of the named manufacturer under our sole responsibility that the listed product conforms to the requirements for the listed European Council Directive(s) and carries the CE mark accordingly.

Manufacturer:	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
Product Name:	Pro1030 Water Quality Instrument
Model Numbers	
Instrument/ Accessory:	Pro1030 (6051030)
Probe/Cable Assemblies:	6051030-1, -4, -10, -20, and -30
Conforms to the following:	
Directives:	EMC 2004/108/EC RoHS 2011/65/EU WEEE 2002/96/EC
Harmonized Standards:	• EN61326-1:2006 (IEC 61326-1:2005) • IEC 61000-3-2:2005 • IEC 61000-3-3:2005
Supplementary Information:	All performance met the operation criteria as follows: 1. ESD, IEC 61000-4-2:2001 2. Radiated Immunity, IEC 61000-4-3:2006 3. Electrical Fast Transient (EFT), IEC 61000-4-4:2004, +Corr. 1:2006 + Corr. 2:2007 4. Radio Frequency, Continuous Conducted Immunity, IEC61000-4-6:2006 5. IEC 6100-4-8:2001
Authorized EU Representative	Xylem Analytics UK Ltd Unit 2 Focal Point, Lacerta Court, Works Road Letchworth, Hertfordshire, SG6 1FJ UK

Signed: Lisa M. Abel Date: 31 Jan 2013
Title: Director of Quality

RECYCLING

YSI is committed to reducing the environmental footprint in the course of doing business. Even though materials reduction is the ultimate goal, we know there must be a concerted effort to responsibly deal with materials after they've served a long, productive life-cycle. YSI's recycling program ensures that old equipment is processed in an environmentally friendly way, reducing the amount of materials going to landfills.

- Printed Circuit Boards are sent to facilities that process and reclaim as much material for recycling as possible.
- Plastics enter a material recycling process and are not incinerated or sent to landfills.
- Batteries are removed and sent to battery recyclers for dedicated metals.

When the time comes for you to recycle, follow the easy steps outlined at www.ysi.com.

BATTERY DISPOSAL

The Pro1030 is powered by alkaline batteries which the user must remove and dispose of when the batteries no longer power the instrument. Disposal requirements vary by country and region, and users are expected to understand and follow the battery disposal requirements for their specific locale.

CONTACT INFORMATION

ORDERING AND TECHNICAL SUPPORT

Telephone: 800 897 4151 (USA)
+1 937 767 7241 (Globally)
Monday through Friday, 8:00 AM to 5:00 ET
Fax: +1 937 767 9353 (orders)
+1 937 767 1058 (technical support)
Email: environmental@ysi.com
Mail: YSI Incorporated
1725 Brannum Lane
Yellow Springs, OH 45387 USA
Internet: ysi.com

When placing an order please have the following available:

1.) YSI account number (if available)
2.) Name and phone number
3.) Purchase Order or Credit Card number
4.) Model Number or brief description
5.) Billing and shipping addresses
6.) Quantity

SERVICE INFORMATION

YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit ysi.com and click 'Support' or contact YSI Technical Support directly at 800-897-4151 (+1 937-767-7241).

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for a YSI Service Center to accept the instrument for service. The form may be downloaded from ysi.com by clicking on the 'Support".

Item # 605182
Rev A
January 2013

APPENDIX C: ALGAE COLLECTION METHOD (LOEB, 1981)

DUGGINS, D. O. 1980. Kelp beds and sea otters: An experimental approach. Ecology **61:** 447–453.

ESTES, J. A., AND J. F. PALMISANO. 1974. Sea otters: Their role in structuring nearshore communities. Science **185:** 1058–1060.

LAWRENCE, J. M. 1975. On the relationship between marine plants and sea urchins. Oceanogr. Mar. Biol. Annu. Rev. **13:** 213–286.

MCLAIN, D. R., F. FAVORITE, AND R. J. LYNN. In press. Marine environmental conditions in the eastern North Pacific ocean—January 1977 to March 1978. Mar. Fish. Rev.

MANN, K. H. 1973. Seaweeds: Their productivity and strategy for growth. Science **182:** 975–981.

———. 1977. Destruction of kelp beds by sea urchins: A cyclical phenomenon or irreversible degradation? Helgol. Wiss. Meeresunters. **30:** 455–467.

PAINE, R. T. 1976. Size-limited predation: An observational and experimental approach with the *Mytilus-Pisaster* interaction. Ecology **57:** 858–873.

———, AND R. L. VADAS. 1969. The effects of grazing by sea urchins, *Strongylocentrotus* spp., on benthic algal populations. Limnol. Oceanogr. **14:** 710–719.

SIMENSTAD, C. A., J. A. ESTES, AND K. W. KENYON. 1978. Aleuts, sea otters and alternate stable-state communities. Science **200:** 403–411.

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Accepted: 8 July 1980

Limnol. Oceanogr., 26(2), 1981, 394–399

An in situ method for measuring the primary productivity and standing crop of the epilithic periphyton community in lentic systems[1]

Abstract—An incubation chamber and a quantitative sampler were developed to measure the primary productivity and standing crop of the epilithic periphyton community in Lake Tahoe. The method allows in situ measurements with minimal disturbance to the natural community. In an experiment comparing the substrate colonization method with the natural epilithic periphyton community, artificial substrate methods underestimated productivity by as much as 95%. The species composition of the periphyton on the colonized substrates was quite different from that of the natural sublittoral epilithic community.

Investigators of periphyton have long relied on the method of colonizing artificial substrates, most commonly glass, although many have noted interpretive problems and questioned that the method could produce reliable information about the undisturbed community (e.g. Castenholz 1960; Wetzel 1965; Brown 1976; Siver 1977; Rosemarin and Gelin 1978). Few workers have measured the primary productivity of lentic epilithic periphyton on natural substrates (Wetzel 1964; Schindler et al. 1973; Loeb and Reuter in press). I describe here an in situ method serviced by SCUBA for measuring the primary productivity of epilithic periphyton in lentic systems, a quantitative sampling device, and the results of an experiment comparing the substrate colonization method with the natural community.

An incubation chamber was built within which ^{14}C productivity could be measured (Steemann Nielsen 1952) with minimal community disturbance. It consists of a hemispherical Plexiglas dome that encloses 200 ml of water above about 50 cm^2 of substrate (Fig. 1). The hemispherical design minimizes light interference and the Plexiglas has excellent transparency, especially with respect to the spectral composition of subsurface light (Roff and Scott 1971). The incubation chamber is sealed to the substrate with a double Neoprene seal to prevent leakage of tracer inoculum during incubation. A check with fluorescein dye indicated no detectable leakage.

There is no continuous circulation of water within the chamber during incu-

[1] This work has been supported by the National Science Foundation grant ENV 77-06506 to C. R. Goldman, and by a Jastro graduate research award to S. L. Loeb from the College of Agricultural and Environmental Sciences, University of California, Davis.

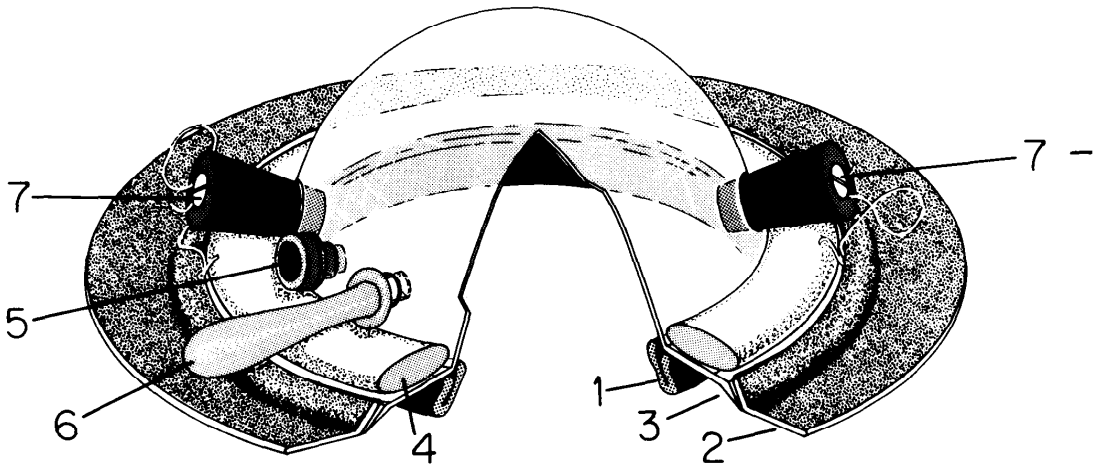

Fig. 1. Incubation chamber, a hemispherical Plexiglas dome, covers about 50 cm^2 of substrate. Chamber seals to substrate via an inner O-ring Neoprene seal (1) and an outer blanket Neoprene seal (2) (shown here in the cutout part of the chamber). Dead-water zone (3) between the seals further reduces possibility of diffusive losses. Chamber is weighted to substrate by a lead ring (4) which rests on outer lip of chamber over the double seal. Inoculum is introduced through a serum cap (5) and mixed within the chamber using the pipette bulb (6). Two ports are corked (7) during incubation and are opened at the end of the incubation to pump radioactive tracers from the chamber into a waste container (plastic bag).

bation. Water movement over benthic substrate surfaces is important in lotic periphyton production (*see* Marker 1976; Rogers et al. 1978 for water-circulating chambers); however, in lentic systems wave-generated circulation decreases rapidly below the eulittoral zone. The Prandtl boundary layer—the zone of zero-flow just above the surface of a substrate—increases in thickness as the flow rate decreases. In Lake Tahoe this phenomenon is illustrated by the layer of fine detrital particles covering the sublittoral substrates; divers observed that this fine particulate layer is readily resuspended when exposed to even the slightest circulation. Continuous water circulation, therefore, is not believed to be characteristic of this benthic environment and, for short incubations (2–4 h), the lack of continuous water circulation within the chamber should have no serious adverse effects on the measured rates of primary production.

The sampler is illustrated in Fig. 2. In use the brushing syringe is pressed down against the substrate and the brush is rotated to detach the periphyton. Figure 3 shows the sampling procedure. The sampler design is similar to the one of Stockner and Armstrong (1971); the addition of a second collector syringe decreases the loss of periphyton during sampling and improves the quantitative performance of the sampler.

A portable submersible laboratory was built to carry the necessary equipment for a three-depth productivity experiment using two light-transparent chambers and one light-opaque chamber per depth. The inoculum, in a sterile plastic bag, is withdrawn at the study site with a syringe through a short piece of Tygon tubing fitted with a serum cap; the bag collapses as the inoculum is withdrawn.

After an experiment the samplers are brought back to the shore laboratory where each is carefully cleaned into a 50-ml centrifuge tube and centrifuged for 5 min. The pellet of periphyton is then transferred onto a preweighed glassine weighing paper, the total wet weight determined, and *immediately* afterward subsamples for the various analyses are taken, placed in preweighed CHN boats, weighed, and oven-dried. This procedure is done quickly to minimize evaporative loss of water from the sample.

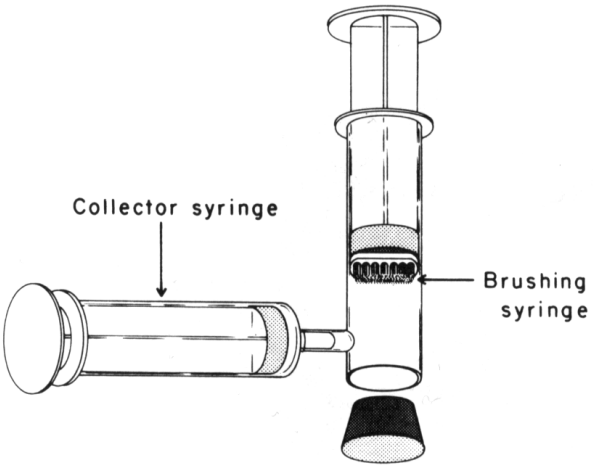

Fig. 2. Periphyton sampler is made from two 60-cc disposable syringes. Brushing syringe has tip-end cut off and a boar-hair brush affixed to the end of its plunger. Collector syringe is attached near base of brushing syringe via a Tygon tube. The device samples 5.3-cm² area of rock substrate.

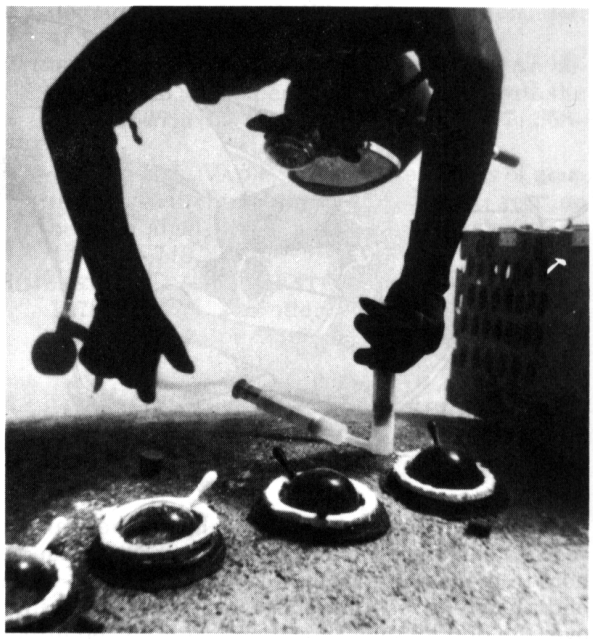

Fig. 3. Sampling procedure involves pressing brushing syringe down against substrate, rotating brush to detach periphyton, pulling brush plunger back and, without lifting sampler off substrate, withdrawing collector syringe plunger. Sampler is then lifted and open end of brushing syringe is corked (photo by R. Richards).

Subsamples for primary productivity are oven-dried (60°C) for 24 h and stored in a vacuum desiccator. The amount of $^{14}CO_2$ assimilated by the periphyton during incubation is determined by combusting the samples and trapping the evolved CO_2 in a trapping solution of 2-aminoethanol and methoxyethanol (1:7). The periphyton samples are combusted in a CHN elemental analyzer (Carlo Erba model 1104) for determination of total particulate carbon (TPC) and nitrogen (TPN), after which the exhaust gas is bubbled into 6 ml of trapping solution. Of this solution, 4 ml is mixed with scintillation fluor (15 ml) [5.0 g 2,5-diphenyloxazole, 0.3 g 2,2′-p-phenylenebis-(5-phenyl) oxazole in 1 liter of toluene] and the trapped $^{14}CO_2$ counted on a liquid scintillation counter (Beckman model L5100). The quenching effect of the trapping solution, determined from a standard quench series, is fairly constant since 4 ml of trapping solution is always added to 15 ml of fluor. (A standard quench series should be run to check this.) The rate of inorganic carbon uptake is determined with the equation

$$^{12}\text{C(uptake)}\cdot\text{m}^{-2}\cdot\text{h}^{-1} = \frac{^{12}\text{C(available)}(IE)\left(\frac{\text{cpm}}{CE\cdot Q}\right)\left(\frac{\text{TSWW}}{\text{SSWW}}\right)}{(\mu\text{Ci }^{14}\text{C added})\left(\frac{\text{dpm}}{\mu\text{Ci}}\right)(A)(T)}$$

where ^{12}C(available) is the amount of dissolved inorganic carbon available (mg·liter^{-1}), IE is the discrimination effect for ^{12}C uptake vs. ^{14}C uptake (1.06), cpm is the ^{14}C counts per minute for the sample, CE is the scintillation counter efficiency, Q is the quench effect (0.76), TSWW is the total sample wet weight,

Table 1. Statistical analysis of an epilithic periphyton productivity experiment run at 2 m in Lake Tahoe.

Chamber	Mean (mg C·m^{-2}·h^{-1})	SE	C.V.	*n*
Dk_1	0.129	0.027	30	2
Dk_2	0.087	0.004	7	2
Lt_1	2.103	0.377	25	2
Lt_2	2.637	0.172	9	2
Lt_3	2.245	0.172	11	2
$\Sigma Dk_{(1,2)}$	0.108	0.021	27	2
$\Sigma Lt_{(1,2,3)}$	2.328	0.160	12	3

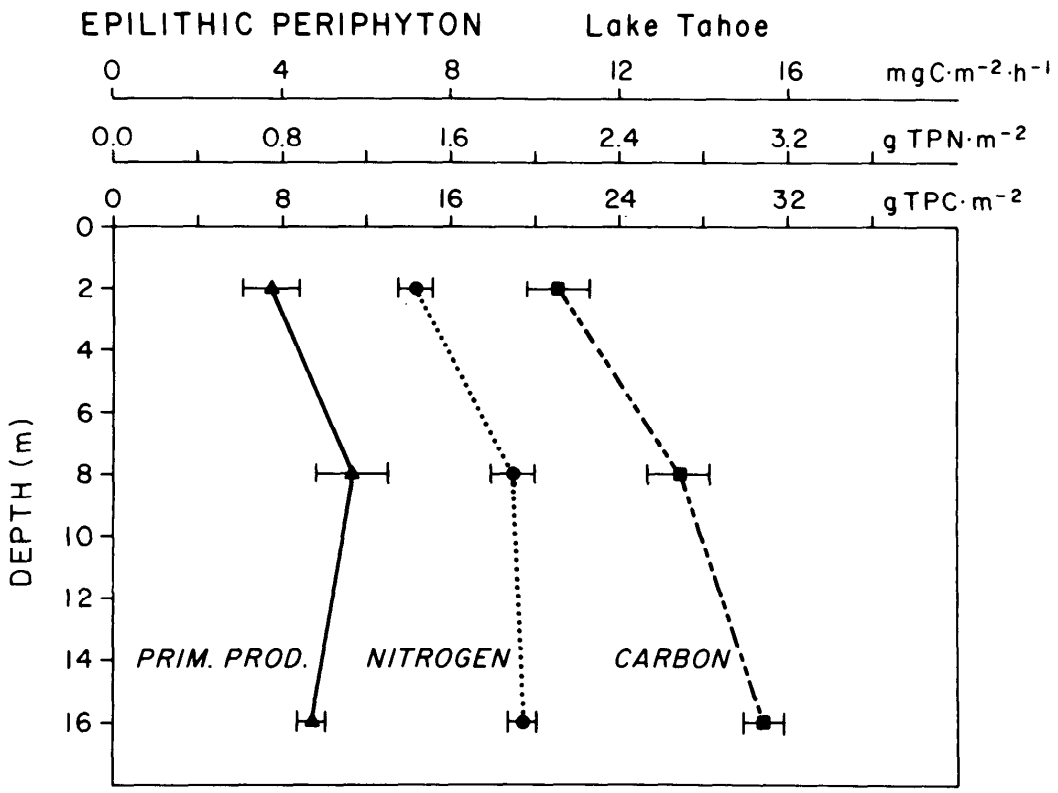

Fig. 4. Primary productivity, total particulate carbon, and nitrogen of epilithic periphyton at 2, 8, and 16 m, 9 May 1978. Error bars, SE of the mean.

SSWW is the subsample wet weight, ^{14}C added refers to the amount added per chamber, dpm per μCi is equal to 2.22×10^6, A is the area sampled ($5.3 \times 10^{-4} m^2$), and T is the incubation time in hours. Concentrations of dissolved inorganic carbon are determined by injecting 0.2 ml of sample water into 5 ml of H_2SO_4 (3 N) which has nitrogen gas bubbling through it. The amount of CO_2 evolved is measured by infrared analysis (Mines Safety Appliances Co., Lira model 202) against solutions of known concentrations of sodium bicarbonate made up in freshly distilled water.

Table 1 gives results from one experiment. Three light-transparent and two opaque chambers were set out on a horizontal rock surface at a depth of 2 m in Lake Tahoe, inoculated with 0.5 ml of

Table 2. Comparison of substrate colonization method with natural epilithic periphyton community. Glass and sterile rock substrates were placed on the bottom at 8 m. After 8 weeks of colonization (3 March 1978–9 May 1978), colonized periphyton community was compared with natural epilithic periphyton community. Sterile rock substrate was a flat rock (about 500 cm^2) removed from the water, brushed and scraped clean, then autoclaved for 60 min.

	Primary productivity (mg C·m⁻²·h⁻¹)	Part C (g C·m⁻²)	Part N (g N·m⁻²)	C:N
Natural*	4.96 (0.87)‡	28.59 (3.02)	1.97 (0.17)	14.51
Glass†	0.25 (0.34)	1.48 (1.40)	0.23 (0.06)	6.43
Sterile rock†	0.25 (0.10)	3.73 (0.37)	0.24 (0.02)	18.65

* Biomass of natural periphyton community dominated by Cyanophyta.
† Biomass of colonized periphyton communities dominated by Bacillariophyta.
‡ SE in parentheses.

$H^{14}CO_3^-$ (20.0 μCi·ml^{-1}) (^{14}C activity standardized using the method described by Goldman 1968), and incubated for 3 h (0950–1250). After incubation two samples were taken within each chamber and two subsamples from each sample were taken for each analysis. The experimental unit for the productivity measurements was the incubation chamber; for the TPC and TPN analyses the experimental unit was the sampler. The coefficient of variation associated with the productivity mean of the light-transparent chambers ($\Sigma Lt_{1,2,3}$) was 12%; the mean of the opaque chambers ($\Sigma Dk_{1,2}$) was <5% of the light-transparent chamber productivity mean.

In an experiment run to compare the substrate colonization method with the naturally growing community, two substrate types were used: rock and glass. The two glass plates (300 cm^2 each) and the sterile rock substrates were placed side by side on the bottom (8 m) for 8 weeks. After this colonization period, primary productivity, TPC, TPN, and species composition were determined for the periphyton growing on each substrate type and for the natural epilithic periphyton community at the same depth (Table 2). Figure 4 shows the primary productivity, TPC, and TPN measured at the same time and location at three depths.

The results of this comparison illustrate some of the problems of the colonization method. The colonization method greatly underestimated both the primary productivity and biomass of the natural periphyton community. The primary productivity of the colonized community was 0.25 mg C·m^{-2}·h^{-1}, about 5% of the value measured using the natural community (4.96 mg C·m^{-2}·h^{-1}). TPC for the colonized community was 5–12%. The species composition of the colonized community was also in striking contrast to the species composition of the natural community. Preferential colonization by diatoms was readily apparent on both colonized substrates, while no colonization by cyanophycean species was observed. The natural sublittoral community contained both diatoms and species of Cyanophyta, the latter dominating the biomass.

In two earlier investigations at Lake Tahoe species of diatoms and filamentous green algae dominated the periphyton community on glass cylinders (Goldman and de Amezaga 1975) and on styrofoam substrates (Flint et al. 1977). The primary productivity of these colonized communities ranged from 0.5–2.5 mg C·m^{-2}·d^{-1} on glass (at a depth of 5 m in water 10 m deep) and 11.1–17.1 mg C·m^{-2}·d^{-1} on styrofoam (at 0.5–1.0 m on the bottom), values about 5–30% of those measured for the natural epilithic community at 2 and 8 m. (Total day productivity values for the natural community were estimated using pyroheliographic light data.)

The species composition of the periphyton colonizing newly submerged substrates resembles that of the natural eulittoral community. The process of colonization is a prominent characteristic of the periphyton in this zone of the lake, since substrates within the eulittoral are annually exposed to desiccation during periods of low lake levels and resubmerged usually in the spring. Use of the colonization method excludes the cyanophycean taxa (e.g. *Tolypothrix*, *Calothrix*, *Rivularia*, *Nostoc*, and *Gloeocapsa*), which apparently do not colonize rapidly. Blue-green algae, however, dominate the biomass of the epilithic periphyton of the upper sublittoral zone of Lake Tahoe (1–60 m), a zone in which the process of colonization is much less important on a year-to-year basis than in the eulittoral zone (Loeb 1980). The utility of the colonization method may therefore be limited since the colonizing community is not representative of the naturally occurring community except in the eulittoral zone. The chamber described here is effective for conducting experiments within the natural sublittoral community with minimal disturbance. The method yields a good return of information for the time invested; a typical experiment generally takes 10–20 min dive time to set up and 15–30 min to collect

the samples. Construction costs were about $15 per incubation chamber and $4 per sampler in 1979. Construction details are available on request.

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Stanford L. Loeb

Institute of Ecology
Division of Environmental Studies
University of California, Davis
Davis 95616

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APPENDIX D: CHAIN OF CUSTODY FORM: CALIFORNIA LABORATORY SERVICES

CHAIN OF CUSTODY **CLS ID. NO.**_____ (___of ___)

Report To:	Client Job Number	PRESERVATIVES ▼	**ANALYSIS REQUESTED**	GEOTRACKER
	Destination Laboratory			EDF REPORT ☐ YES ☐ NO
Project Manager	CALIFORNIA LABORATORY SERVICES *Committed. Responsive. Flexible.*			GLOBAL ID.
Project Name	☐ CLS (916) 638-7301 3249 Fitzgerald Road Rancho Cordova, CA 95742 www.californialab.com			FIELD CONDITIONS:
Sampled By				
Job Description	☐ OTHER			
Site Location				**TURNAROUND TIME IN DAYS** 1 2 3 5 / **SPECIAL INSTRUCTIONS**

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	CONTAINER MATRIX	CONTAINER NO.	CONTAINER TYPE												
																		INVOICE TO:
																		PO#
																		QUOTE#

SUSPECTED CONSTITUENTS | SAMPLE RETENTION TIME | PRESERVATIVES (1) HCL (2) HNO_3 (3) = COLD (4)= H_2SO_4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY

RECEIVED AT LAB BY: | **DATE/TIME:** | **CONDITIONS/COMMENTS:**

SHIPPED BY: ☐ **FED EX** ☐ **UPS** ☐ **OTHER** _____ **AIR BILL #** _____